BRISTOL

Naturalists' Society.

ESTABLISHED 1862.

REPORT OF THE COUNCIL,

READ AND ADOPTED AT THE

FIRST ANNUAL MEETING

OF THE SOCIETY,

HELD MAY 8TH, 1863.

WITH

THE RULES, LIST OF OFFICERS, AND LIST OF MEMBERS.

CLIFTON: MARDON AND CO., ROYAL PROMENADE.

LIST OF OFFICERS,

AS APPOINTED AT THE ANNUAL MEETING, MAY 8TH, 1863.

PRESIDENT.

WILLIAM SANDERS, F. G. S.

VICE-PRESIDENTS.

REV. CANON GUTHRIE | ALFRED DAY, LL. D.

MEMBERS OF THE COUNCIL.

JOHN BEDDOE, M.D.
WILLIAM J. FEDDEN
HENRY E. FRIPP, M.D.
WM. B. HERAPATH, M.D., F.R.S.
SAMUEL MARTYN, M.D.
HUGH OWEN.

TREASURER.

W. W. STODDART.

HONORARY SECRETARY.

ADOLPH LEIPNER, 22, Upper Park Street.

HONORARY REPORTING SECRETARY.

WM. LANT CARPENTER, B. A., B. Sc.

REPORT.

In presenting their First Annual Report of the transactions of the Bristol Naturalists' Society, your Council have much pleasure in calling attention to the steady increase in the number of its members, and the generally prosperous condition of its affairs.

During the past year 28 new ordinary members have been elected, making with 167 original members a total of 195. Two honorary members have been appointed in addition to the 11 on whom the distinction was originally conferred, making 13 of this class, so that the total of ordinary and honorary members is now 208; this Society being the largest association of a purely scientific kind that has been in operation amongst the citizens of Bristol.

The first meeting, at which papers were read, was held on Thursday, June the 5th, when your President, Mr. William Sanders, gave a sketch of the Geology of Portishead, embodying the result of his own extended observations of this district, and its relation to the neighbouring formations. On the same evening, Dr. Martyn read a paper on the Structure of Cartilage, and Mr. J. W. Morris on the Natural History of the Testacella, or Burrowing Slug.

On July 8th your Society took its first excursion to Bath, thence, in company with Mr. Charles Moore, (since added to the list of honorary members) they proceeded over Hampton Downs to Claverton, and along the Kennet and Avon Canal, omitting no object of interest likely to attract the attention of a student of nature, or to call forth discussion. The day passed very pleasantly and instructively, and the members looked forward with increased interest to a second excursion. This took place on the 8th of August, when the

Geologists mustered in force to examine, under the guidance of the Rev. Frederick Smithe, one of your honorary members, the Cynocephala Bed of Mr. Lycett, near Frocester, and the Cephalopoda Bed of the same series, in the Oolite contiguous to Dursley. The party returned home after dining at Dursley, well pleased with the day's proceedings.

The third and last excursion (to which ladies were invited) took place on the 8th of September, to Portishead, when a numerous party availed themselves of the welcome opportunity of renewing their acquaintance with the interesting geological features and noticeable botanical and entomological objects of that favorite watering place.

This closed the field studies and out-door recreations of the Society for the year 1862; but it is proper to add, that the repetition, from year to year, of these delightful trips is looked forward to with great satisfaction by many of the members, and will prove a great and increasing source of attraction for the future.

On the 2nd of October the session of the Society may be considered to have fairly commenced for continuous business. On this occasion Dr. William Bird Herapath gave a paper on the Echinodermata, and Mr. W. W. Stoddart, your Treasurer, another on certain Fossil Plant Beds in the Isle of Wight.

On November the 6th, Dr. Beddoe read a paper on the Physical Characters of the Natives of this District, and Mr. W. W. Stoddart made some remarks on Stipa Tenacissima as a substitute for Rags.

The evening of the 4th December was occupied by Mr. Adolph Leipner, your Hon. Secretary, on Textile Vegetable Fibres, and especially on the Zostera Marina as a substitute for Cotton—also with a second short series of notes on the History of a Tortoise, by the same. On that occasion too, Mr. William Lant Carpenter gave a clear and interesting account of Professor Graham's researches in Dialysis.

At the meeting held on the 8th January in the present year two communications were read, one from Dr. Day, one of your Vice-Presidents, on the methods used by Mr. Bunt in investigating and predicting the Tides of the Port of Bristol, and the other by Dr. William Bird Herapath, on the presence of Arsenic and Thallium in the ores and medicinal preparations of Bismuth.

On February the 5th, Mr. Charles Bortill Dunn read a paper on the Nature, Cultivation, and Use of the Cotton Plant, and Mr. Hugh Owen one, in which he showed, that great departure from established types is not always a sufficient reason for generic or specific distinction amongst the Mollusca, which was illustrated by recent and fossil specimens.

On March the 5th, Mr. William Sanders gave an account of the discovery of the remains of Holoptychius in the Old Red Sandstone of Portishead, and Mr. W. W. Stoddart brought forward his extensive collection of recent and fossil Otoliths, obtained by dissection and by examination of Tertiary Strata containing fish remains, with a view to establish by comparison and analogy the relations of auditory structure in the lower animals.

At the meeting of April the 2nd, which terminated the scientific proceedings of the first year of our Society, Dr. Alfred Day completed his elaborate and able commentary on Mr. Bunt's method of calculating and predicting the Tides of the Port of Bristol. A detailed description of the means employed by Mr. Bunt, and illustration by tables, added to the value of this paper.

At the various meetings animated discussions have been sustained, showing, that there exists amongst us a considerable amount of careful observation and study of natural phenomena, which may be fairly expected to bring forth a future harvest of good fruit. And your council entertains a strong conviction, that the operation of such a Society as this must, in the course of a short time, be widely felt, and will be the means of reviving that personal interest in the investigation and discovery of scientific facts, which too often declines for want of adequate stimulus to

systematic enquiry, or fails from deficient co-operation and from the disuse of regular observation, record, and practical discussion.

Your Society has continued to meet every month within the walls of the Bristol Institution, where every accomodation has been afforded to it, and the use of specimens from its valuable Museum freely granted by the authorities for purposes of comparison or illustration. It is proposed to acknowledge the liberality of the Institution by appropriating from the surplus funds of this Society a contribution to its Museum, which has strong claims on public consideration, both from its extent and completeness, and the ample access afforded to its valuable stores by those who have the charge of it; and in recommending this course your Council is of opinion, that you will be strictly carrying out one of the objects of your Society, viz.—the promotion of its particular class of studies.

Your Council also recommend the enlarging its numbers by the addition of members to act with the regular officers of the Society as a council.

Your Council are happy to state that in general the meetings have been well attended, (the average attendance having been from fifty to sixty), and that the character of the papers has been creditable to the Society, and induces the hope that it will in future be well sustained. Mr. William Lant Carpenter has, for the last four months, kindly undertaken the reporting, and has already placed himself in communication with some of the scientific serials.

W. W. STODDART, *Treasurer, in Account with* THE BRISTOL NATURALISTS' SOCIETY.

Dr. INCOME AND EXPENDITURE. **Cr.**

Date	Income	£	s.	d.	Date	Expenditure	£	s.	d.
1863.					1862.				
May 5.	To Subscriptions actually received to this date	64	15	0	July 15.	By Cash Paid Tanner Brothers ...	0	10	3
					Aug. 6.	,, Hemmons, Printer ...	4	0	0
					27.	,, Mardon & Co., Stationers	2	6	7
					1863.				
					Jan. 8.	,, Bromhead, Ironmonger	0	2	0
					Feb 25.	,, Mardon & Co. ...	2	12	6
					May 6.	Sending Notices, Gratuities, and other Expenses, per the Secretary ...	11	9	3
						By Balance in hand	43	14	5
		£64	15	0			£64	15	0
	To Balance brought forward	43	14	5					

May 5th, 1863. To Arrears of Subscriptions payable on January 1st, 1863 ... ... £27 10 0

Audited, 6th May, 1863,

F. K. BARNES,

C. G. HEAVEN.

RULES.

I.

That this Society be called the BRISTOL NATURALISTS' SOCIETY;—and that its object be the communication of new and interesting information on objects connected with Natural Science.

II.

That the Society consist of Ordinary and Corresponding Members; that the number of members be unlimited.

III.

That the management of the Society be vested in a Council, consisting of a President, two Vice-Presidents, two Secretaries, and a Treasurer, to be elected annually, together with six Ordinary Members, of whom two shall retire annually, to be replaced by two other members of the Society.

IV.

That the Society meet at the rooms of the Bristol Philosophical Institution, on the *first* Thursday in every month. That the members be summoned for, and the chair be taken at, half-past seven o'clock, P. M. That the President be chairman at the meetings of the Society, or in his absence one of the Vice Presidents, or in case the Vice-Presidents be also absent, then the meeting may choose a chairman from among the members Present.

V.

That the Secretary be required to send a notice of each meeting to every member, not later than the previous Monday; that such notice contain "Proposed alterations of rules," "Names of new members for ballot," and "Subjects for the evening."

VI.

That the Council be expected to provide subjects for the evening; and that any member desirous of making a scientific communication be requested to give notice beforehand to the Secretary.

VII.

That the author of each communication write an abstract of it on paper of an agreed uniform size, to be placed in the Abstract-book of the Society; and that the Secretary send a short account of each meeting, to some suitable journal for publication.

VIII.

That each member be at liberty, with the Chairman's permission, to introduce a friend at any monthly meeting, subject to his withdrawal in case of private business having to be transacted.

IX.

That all ordinary members subscribe Five Shillings per annum towards defraying the expenses of the society,—the subscription to commence at their entrance, and to be renewed on the first meeting in January.

X.

That members of the Bristol Philosophical and Microscopic societies desiring to become members of this Society, may, upon written application, be so entered. That every other candidate for admission be nominated and seconded at one monthly meeting, and be ballotted for at the next; the name of the candidate and the intention to ballot being expressed in the notices for the latter of such meetings, and that upon the ballot one black ball in five be sufficient to prevent admission.

XI.

That Corresponding Members be proposed by the executive officers of the society, without ballot.

XII.

That the Secretary be required to give to every new member notice of his election, and a copy of the rules.

XIII.

That the Council arrange two or more Excursion-meetings, to be substituted for the ordinary monthly meetings, in the course of the Summer.

XIV.

That the annual meeting be held on the first Thursday in May, at which time the various officers be elected.

XV.

That at the meeting next preceding the annual meeting, two members shall be appointed to audit the accounts; and that at the annual meeting the audited general account of the society shall be read by the Treasurer.

XVI.

That any new rule may be made, or any existing rule repealed or altered at any meeting, on motion duly made and seconded, if carried by two-thirds of the members present, but subject to be confirmed by a like majority at the next succeeding meeting, except in the case of rules passed at the annual meeting, when subsequent confirmation shall be dispensed with; the intention to propose any such alterations or new rules having been notified in the summonses.

LIST OF MEMBERS.

Frederick Ashmead
J. Beavington Atkinson
Clement Baber
William F. Badock
J. Barber
Francis K. Barnes
Stephen Barton
John Perry Barton
John Beddoe, M.D.
Richard C. Beddoe
William Benham, LL.D.
Ralph M. Bernard
James Bigwood, Jun.
Francis P. Bisson
Henry Bolt
Charles Boorne
J. Bourne
Rev. G. W. Braikenridge
Alfred Brittan
Frederick Brittan, M.D.
Samuel Woolcott Browne
Thomas Bucklee
John Payne Budgett
W. Hill Budgett
George Forster Burder, M.D.
William Corbett Burder, F.R.A.S.
Alfred Burleigh
Alexander Caird
Rev. J. W. Caldicott, M.A.
William Lant Carpenter, B.A.
William G. Carter, M.D.
Thomas S. Cayzer
J. P. Challicombe, M.D.
John Moss Chandler
Thomas Edward Clark
William Clark
W. Michell Clarke
John Colthurst
E. F. Colthurst
Thomas Coomber
Handel Cossham, F.G.S.
James M. Crichton
Charles Dando
Charles Daubeny
David Davis
Alfred Day, LL.D.
James Derham
Samuel Derham
Edwin Down
William Evans
John T. Exley, M.A.
William J. Fedden
W. B. Fegen
Walter Fiddes
Rev. W. F. Fisher
Charles Henry Fox, M.D.
Charles Joseph Fox, M.D.
Edward Long Fox, M.D.
Edwin F. Fox
William Frayne

LIST OF CORRESPONDING MEMBERS.

William B. Carpenter, Esq., M.D., F.R.S, etc., London.

Philip P. Carpenter, Esq., B.A. Ph. D., Manchester.

Robert Etheridge, Esq., F.G.S., Museum of Economic Geology, London.

J. P. Galienne, Esq., Guernsey.

Rupert Jones, Esq., F.G.S., Somerset House, London.

Edwin Lankester, Esq., M.D., F.R.S., Kensington Museum, London.

Frederick Layard, Esq., late of Ceylon.

Charles Moore, Esq., F.G.S., Bath

George E. Roberts, Esq., F.G.S., Somerset House, London.

H. J. Slack, Esq., F.G.S., London.

Rev. Frederick Smithe, M.A., F.G.S., Highley Vicarage.

CLIFTON, MARCH, 1862.

Dear Sir,

A desire having been expressed by many gentlemen in our City and its vicinity, interested in the pursuit of Natural History, Geology, and the allied sciences, that a Society should be formed on principles similar to those so successfully carried out at Worcester, Malvern, Liverpool, and other towns; we have ventured to take some preliminary steps towards its accomplishment.

Our own neighbourhood affording as it does so great a scope to the Natural Historian, and so wide a field to the Geologist, is admirably suited for the operation of such a Society, and renders it equally desirable for the social and scientific interests of the citizens of Bristol. We are anxious to restore to Bristol the prestige it once possessed in this respect, and invite you to join the Society, and give it your assistance and support, in full confidence that it will be to our mutual advantage.

A slight sketch of the proposed basis of operations is given on the other side. Requesting the favor of an early reply,

We remain, dear Sir,

Very truly yours,

STEPHEN BARTON
JOHN BEDDOE, M. D.
W. J. FEDDEN
HENRY E. FRIPP, M. D.
C. T. HUDSON
W. W. STODDART
ADOLPH LEIPNER

Provisional Committee.

Provisional Honorary Secretary,
22, Upper Park Street, Clifton.

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1. That the meetings take place once a month.

2. That a small sum be annually subscribed to cover working expenses.

3. That the business of the meetings be the reading of papers, or the exhibition and explanation of objects of scientific interest.

4. That short excursions be from time to time proposed.

5. That the members be balloted for.*

6. That the transactions be published in the most suitable periodicals.

7. No fines for non-attendance.

8. Papers not compulsory.

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Bristol Naturalists' Society.

Sir,

The Council having fully considered certain proposals and applications made by several Members engaged in furthering the special objects and studies of the Society, are desirous of urging the formation of a Library of various costly and useful scientific works, and hereby invite attention to the subject.

A request of the Council has already been made, and kindly granted by the Committee of the Bristol Institution, to allow this proposed Library to be located in their building.

It has been determined to obtain donations and to set on foot a voluntary subscription of not less than one shilling annually from each Subscriber. The Library will, however, be open to all Members of the Society, whether Subscribers or not.

As the success of the Library will be proportionate to the interest manifested by the Members of the Society, and their active co-operation in the undertaking, the Council hope that all Members will cordially respond to this application, and forward to the Hon. Secretary their assent.

By Order of the Council,

ADOLPH LEIPNER,
Hon. Secretary.

22, Upper Park Street, Clifton,

December 29th. 1864

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Bristol Naturalists' Society.

Sir,

I beg to inform you, that in accordance with the opinion expressed at the Annual Meeting on the 5th May, 1864, the Council have taken into consideration the range of country, over which the attention of those Members, who may be willing to assist in compiling the account of the Natural History of this neighbourhood, should be limited: and consider it desirable, that the attention of Members be first directed to the exploration of the district lying within a radius of 9 miles around Bristol, and corresponding with the area of the small circular maps of this tract of country, which will be divided by lines into single-numbered square miles. The Council, at the same time, do not wish to discourage those Members, who may be able and willing to make returns from more distant localities; and wish it to be understood, that the Natural History of such places as Aust, Clevedon, Weston-super-Mare, &c., will be published separately as Appendices to the general Work, if sufficient observations be recorded to justify their publication; and that even *isolated* observations made outside the 9 miles radius, yet sufficiently belonging to the Natural History of the district, will be published in the body of the Work, provided their occurrence has not been elsewhere recorded.

The price of the maps divided into numbered square miles is *plain* 1s. 6d. each, *mounted on cloth and folded*, 3s. each, and can be had only by application to the Honorary Secretary, from whom also the printed registering papers may be obtained.

An Entomological Section having been formed, Members wishing to join it, are requested to apply to the Honorary Secretary, who will communicate all requisite particulars.

It is further in contemplation to form sections for Botany and Geology, in which sections the co-operation of Members is particularly requested.

The Honorary Secretary is desirous of receiving Names of Members, in order that he may arrange the details of operation as soon as possible.

I am, Sir,

Your obedient Servant,

ADOLPH LEIPNER,

Honorary Secretary.

22, *Upper Park Street, Bristol.*
June 3rd, 1864.

BRISTOL NATURALISTS' SOCIETY.

From the "Bristol Daily Post" of Nov. 9.

Notwithstanding the unfavourable state of the weather last Thursday evening, there was a good attendance at the usual monthly meeting of this society, at the Philosophical Institution; and we were much pleased to see several lady visitors, in accordance with the recently-altered regulations of the society.

After the transaction of some routine business, and the election of four new members, the president, Mr. W. Sanders, announced that an attack of illness prevented Mr. Hugh Owen from reading his promised paper, and he therefore called upon Mr. W. W. Stoddart for his paper on "Tea and its Adulterations."

At the commencement, Mr. Stoddart said that he wished thus publicly to contradict an assertion that he, in a recent lecture, had accused the grocers of Bristol of adulterating their tea. The fact was, as he would soon show, that he had had very great difficulty in getting adulterated samples; at all the respectable grocers', and many of the minor shops, where he had obtained samples, he invariably found genuine tea sold. The tea-plant, the author stated, belonged to the same natural order as the camellias, and there was very good reason to believe that all the teas of commerce were obtained from varieties of one and the same species of plant. The seed was sown in March, transplanted in a year, and the plants placed in rows, three or four feet apart, and kept down to a height of three feet by cutting off the top shoot. Leaves were gathered from a plant between the ages of five and twelve years. There were three gatherings in a year; the first in May, which yielded white woolly twigs, whence the name Pekoe. The tea cultivation in China extended over 3½ millions of acres, with an average yearly produce of a million tons, of which Great Britain consumed about one forty-fifth part. Mr. Stoddart then explained that green and black tea were made from the same leaves—those for green tea being gathered and dried as quickly as possible; those for black being much exposed to air, &c., before drying, which favoured the production of a peculiar oil, to which black tea owed its peculiar properties. By distilling black tea with water, this oil could be obtained in a pure state, and was found to be very intoxicating: a hundredweight of tea would yield a pound of this oil. A very important constituent of the tea-leaf was the alkaloid theine, found also in the coffee plant and others. The proportion by weight was two per cent. It was a white crystalline substance, with no smell, and a slightly bitter taste—there was less of it in black than in green tea. Chemically, this substance much resembled one of the constituents of the bile, and, like it, would, under certain conditions, give rise to a most brilliant purple dye. Tannic acid (found largely in oak bark) existed in tea to the extent of one-fourth their weight. Boiling water dissolved 40 per cent. of the leaves, extracting the oil, the theine, and the tannic acid. What remained behind was the most nutritious of all, viz., the gluten, the presence of which in flour, peas, beans, &c., gave such foods their flesh-forming power; the addition of soda to the infusion caused more of this gluten to be dissolved, and therefore the tea was more nutritious, but the constant employment of an alkali was deleterious to health. The "steppe water" from which the Tartars made their tea was highly alkaline, hence their tea was much more sustaining. The alkaloid theine acted upon the body in a very remarkable, and hitherto unexplained, manner; viz., it prevented the wasting away of the muscular and other tissues—and therefore, though it did not actually nourish, it was a very good preservative of the flesh—hence the well-known fact that poor people who unhappily were stinted in their food consumed so much tea. Too much tea, it was well known, acted hurtfully on the system, but the mode was unexplained as yet. Mr. Stoddart then proceeded to speak of

the adulteration of tea, and said it was with great difficulty that he obtained any adulterated samples. He exhibited four, obtained by a friend of his from the *bottoms* of some tea-chests in London. The first sample contained black-lead; a second, indigo blue; a third, French chalk and Prussian blue; and a fourth, verdigris. The chemical tests of these substances were shown and explained—it being understood that these were not such samples as could be bought at a retail shop. One sample, however, purchased at a huckster's shop in St. Philip's, contained a great number of leaves besides tea—among them being those of the hawthorn, elm, birch, willow, domestic plum, and others—the botanical distinctions between these and true tea being pointed out. In conclusion, Mr. Stoddart urged most emphatically that it was usually the consumer's fault, in not giving a fair price, if the article he obtained was adulterated. In the course of a conversation which ensued, Mr. Stoddart stated that the tea-improvers, &c., commonly sold, were either carbonate of soda, which facilitated the extraction of the tannic acid in the tea, or else catechu, which was nearly pure tannic acid.

WM. LANT CARPENTER,

Hon. Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the BRISTOL DAILY POST *of December* 7.

The third monthly meeting for this session was held at the Philosophical Institution on Thursday evening last, Mr. W. Sanders, the president, occupying the chair. The attendance was larger than we remember to have noticed on any former occasion, upwards of seventy, several of whom were ladies, thus evincing their interest in the proceedings of the society. It is greatly to be hoped that the future meetings will be still more largely attended.

The business of the evening consisted in the reading of, and discussion upon, three papers; two of which had especial reference to the New Zealand Chiefs who recently visited Bristol.

The first was a verbal communication from Dr. Beddoe, on the Maori race. This word meant "strangers"—as the present inhabitants were not aborigines, very distinct traditions existing of their ancestors having come in canoes from some one or more of the Polynesian islands more than 600 years ago. The present inhabitants of the numerous islands known as Polynesia, might be divided into two great races, the superior of which was derived from the Malay, and inhabited the numerous small islands—and it was from this race that the Maories chiefly sprang. The larger islands, which lay between the Malay peninsula and Polynesia proper, were peopled by a black race, inferior to the other in civilization, &c., with dark frizzly hair, to which they paid great attention, using a neck-pillow to support it. The Feejee islanders were an example of this race. Some proportion of their blood also existed in the Maori race—hence it would appear (though tradition does not bear it out) as though the aborigines of New Zealand belonged to the inferior race, and were subjugated by the other; in fact, the Maories differed more from the Malay race than the true Polynesians did. With respect to the present Maories, the author considered them as a fine race, though the seven chiefs who lately visited Bristol were certainly picked specimens. The average height was 5 ft. 6¼ in., and Dr. Thompson stated them to have longer bodies and arms, but shorter legs, than Europeans. The form and capacity of the head did not differ widely from the European—especially the Celtic—while the features resembled those of American Indians. In those individuals who possessed more of the blood of the lower race, the cheek-bones were very wide. The speaker then described the painful process of tattooing. The holes in the skin were made with a kind of lancet, and various sorts of charcoal constituted the colouring matter; the leading artistic idea appeared to be the imitation of the scales of certain fishes. Dr. Beddoe concluded by offering a few remarks on the decline of the race during the last forty years. Among other causes he noticed the desolating wars among themselves; certain obvious faults in their mode of life, as close sleeping and the excessive use of tobacco; and a variety of diseases introduced by the English settlers. In conclusion, he said he did not see how we could help being drawn into the last stage of the war, but urged that our previous relations with them, the high qualities they had shown, and lastly, our common Christianity, should make us wish to treat them as mildly as possible.

Mr. CHARLES OTTLEY GROOME then read a long paper, entitled, "On certain characteristics of the cranium of the New Zealanders." He described, in a very amusing manner, the various classes into which heads might be divided, according to their shape—as round, wedge-shaped, conical, oval, &c.—giving the general mental characteristics usually found to accompany these, and then gave a detailed account of the results of his examination of the heads of the seven chiefs and two women who were at present in England, with his conjectures of their characters, insisting strongly on the fact

that they were picked specimens of the race. He considered the race as much wanting new blood and vital force, having, however, great individuality and powers of application. Their courage was greater than that of any warriors not trained in the European manner. In conclusion, he urged the necessity of a resolute policy, and only wished that their councils were directed by such men as the chiefs of whom he had spoken.

Mr. W. SANDERS, in presenting the thanks of the society to Mr. Groome, observed that though such observations were hardly consistent with the pure inductive spirit which should guide true science, still they were very interesting.

Both these papers were illustrated by the heads of New Zealanders in the museum of the institution, and by drawings of the seven chiefs by Dr. Swayne, who, having also been in New Zealand, offered a few remarks at the close, relative to the causes of the ill-feeling between the Maories and the settlers. He considered them to be deep-seated, and to have reference especially to the land, as the Maori naturally objected to part with land which had long been held by his ancestors.

The last paper was by Mr. FREDERICK MARTIN, on the marine zoology of Clevedon. The author stated that his object was simply to enumerate and describe those species of marine animals which he had himself met with, as they were more numerous than he at first supposed. Ascending in the scale of animal life, he commenced with the hydroid polypes —having found two species of *sertularia* plentifully in the rock pools. Of the actiniae, or sea anemones, two species occurred: *A. mesembryanthemum*, like small lumps of red or green jelly, which would readily multiply in confinement, and *A. crassicornis*, which was very voracious, even eating crabs of its own size, varied very much in colour, and was difficult to keep in confinement. Of *echinodermata* the only species the author had found was the red twelve-armed starfish, *solaster papposa*, which lived on the rocks on the shore near Ladies' Bay. This starfish had long been known to feed on the inhabitants of bivalve shells, and recent discoveries had shown that it got them out by injecting drops of poisonous liquid between the valves of the shell. Of the *annelids*, or worms, two species occurred: *pectinaria*, which protected its body with fragments of shell, and *nereis*, a free swimming animal, whose body was composed of consecutive similar rings. It had a most formidable mouth, and fastened on fish, often killing them. Many species of crustacea inhabited the neighbourhood; the prawn being rare, but the shrimp abounding; the small sandhoppers and spider-like crabs were frequent, as also the green shore crab, and the hermit crab, which had a soft body, and therefore inhabited empty univalve shells. They were very pugnacious, and would live well in an aquarium. Of the cirrhipedes, two species of sessile barnacles occurred; and of the mollusca, two bivalves and nine univalves.

Mr. Martin illustrated his paper in the most complete manner by specimens of the animals, many of which were alive and apparently healthy, and others preserved in the most life-like manner.

Mr. W. SANDERS observed that the lateness of the hour prevented a discussion on this most interesting paper, but he could not help characterizing it as the good work of a good naturalist, and as containing the kind of information which it ought to be the special object of the society to elicit.

After spending a considerable time in the examination of Mr. Martin's specimens, the meeting separated.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the Bristol Daily Post *of January* 11.

Last Thursday evening this society held its usual monthly meeting at the Philosophical Institution. About thirty members and friends were present, including several ladies, notwithstanding the inclemency of the weather. The usual formal business having been transacted, the president, Mr. W. Sanders, called upon Dr. Martyn to read the first paper.

The Author stated that it was simply his intention to exhibit two specimens of a foreign species of holothuria (sea cucumber) which had been lent him by Major Giberne, and to make a few remarks upon them. The specimens were dry, and about four inches long, which was the form in which they were met with in commerce, under the name of trepang, large quantities of which were used in China for making soup. Boiled with water this dry mass swelled up greatly, the decoction having a slight meaty flavour, and, in the concentrated state, slowly gelatinising. The chemical reactions indicated that it consisted mainly of chondrine. a substance nearly allied to gelatine. Dr. Martyn then briefly explained the position occupied by the holothuridæ in the animal kingdom. Though called sea-slugs, they were really far below the true slugs in organisation, belonging, as they did, to the class echinodermata, in the lowest sub-kingdom, radiata. The animal consisted mainly of a great digestive sac, covered with a tough fibro-cartilaginous skin, in which were inserted calcareous plates, which were well known as microscopic objects. Projecting from various parts of the body were the ambulacra or sucking feet, which, when drawn in, caused the warty appearance of a cucumber; and at one end was a set of tentacles, in which alone was the radiate arrangement visible. In European seas these animals were neither numerous nor brilliantly coloured, but the reverse was the case in tropical seas. Though one species was eaten by Neapolitan fishermen, the chief consumers were the Chinese, who import it largely from the Indian archipelago, as much as 8333 cwt. being annually sent from Macassar, in the Celebes, alone, employing 200 boats from January to May. The commonest holothuria taken varied from 8in. to 2ft. in length, and was usually got by divers, though some of the larger kinds were procured by spearing in shallow water. They were stated to be usually split down one side, boiled, pressed with stones, dried in the sun, and then stowed away in bags. *De gustibus non est disputandum;* but looked at philosophically, this trepang, with its chondrine-yielding gristly coat, and muscles in addition, would seem to yield a nutritive matter, chemically resembling turtle soup, with perhaps an addition of beef tea.

A short discussion ensued, after which

Mr. Samuel Henry Swayne read a paper on "The Anthropoid Apes," having special reference to the gorilla, the skulls of which were exhibited, and which, belonging to the museum of the Institution, were the first portions of any gorilla brought to Europe. Glancing first at what was previously known of these animals, the first mention appeared in the "Periplus," or voyage of Hanno, a Carthaginian, who

lived from 300 to 500 B.C., who mentions having met wild men in West Africa, which he called 'gorullæ." In 1699, Tyson, a British anatomist, published a description of a chimpanzee, and at a later period, an ourang-outang (woodman), from Borneo, became known to naturalists. In 1780, the then governor of Batavia, sent to Holland the skeleton of a large tail-less ape, named the 'Pongo.' In 1835, it was shown by Owen that the Bornean ourang was the young form of this pongo, of which there appeared to be two species. In 1847, Mr. Stutchbury, then curator of the Institution, obtained through the captain of an African vessel trading to Bristol, several skulls, three of which were forwarded to Professor Owen for examination, the result of which was embodied in a paper in the 3rd vol. of the "Zoological Society's Transactions." In 1858, an adult specimen reached the British Museum, since when this ape had attracted much public attention in connexion with the African explorer Du Chaillu. The general form and habits of the animal being tolerably well known, the author proceeded to point out some of the special anatomical distinctions between it and man on the one hand, and the chimpanzee, &c., on the other. The superciliary ridges above the eyes were very prominent. The head passed by a short thick neck into the trunk, the profile of which presented only a single curve, unlike the double curve in man, and the vertebræ were nearly all the same size. There was very little difference in the size of the limbs at the different parts, no calf to the leg for instance, but as regards the relative length of the arms to the trunk, and of the arm to the forearm, the gorilla was nearer to man than the other apes, and also in the size of the heel bone and ability to apply the foot flatly to the ground, as well as the form of the bone of the pelvis. As in all apes, the head was articulated with the neck at some distance behind the middle, where it is in man, and the great size of the lower jaw compared with that of the brain case gave a very bestial aspect to the face. This difference was, however, less in the young than the adult state; in this particular the chimpanzee was nearer to man than the gorilla. After going somewhat minutely into the cranial characteristics of the gorilla as compared with man, and pointing out that points of resemblance in the young state rapidly became less towards maturity, Mr. Swayne concluded a very able paper by expressing his belief that a due balancing of all the evidence led to the conclusion that, whichever of these apes most nearly resembled man, the superiority of one over another was of very slight importance in view of the enormous gap which separated the highest known ape from the most debased type of humanity with which we we were acquainted.

A short discussion ensued, which was closed by the announcement that the hour for closing the meeting had arrived.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the "Bristol Daily Post" *of February 8th*, 1864.

The fifth monthly meeting of this society for this session took place on Thursday evening last, at the Philosophical Institution, and was attended by about thirty members and several ladies.

Upon the recommendation of the council, it was resolved to purchase an apteryx offered for sale by M. Charbonnier, in order to present it at a future time to the museum of the institution. The secretary, Mr. Leipner, stated that this curious bird, which was remarkable as having no wings, only rudiments of them, was becoming extremely rare. It inhabited New Zealand, and an Australian museum had recently paid £100 for a pair. The Earl of Derby had, without success, offered £500 for a living specimen.

The President (Mr. W. Sanders) then introduced Mr. Charles Moore, F.G.S., of Bath, who had kindly undertaken to give a paper, entitled, "Results of a Geological Ramble to Patchway."

Mr. Moore, after adverting to the excursion of the society in August last over a portion of the South Wales Union Railway, and the unfortunate weather which obliged geologists on that occasion to use their umbrellas far more than their hammers, explained that, after leaving Bristol, the line passed through a cutting in some red marls, belonging to the upper red sandstone, and then over an open country where the beds of the lower lias, geologically higher than the N.R.S., appeared. This series was incomplete, containing only the ammonites bucklandi beds, and lay unconformably upon the white lias. At Patchway, a set of beds, known as the rhætic beds, presented themselves, belonging to the Triassic or N.R.S. period, which were only 30 feet in thickness in this country, but on the continent they attained 5000 feet. The rocks through which the Over tunnel passed could only be judged of from the heaps of stone round the mouths of the shafts, at the first and second of which undoubted new red marls were found; at the third, something supposed at first to be white lias, or by others the refuse of a limekiln; and at the fourth a very dense quartzose sandstone. In the cutting at the mouth of the tunnel was a very remarkable series of contorted beds, containing coal, fireclay, and many other minerals. It was, however, to the stone around the mouth of the third shaft that the author's special attention had been directed, and he described, in an amusing manner, the difficulty he met with in getting a load of the stone removed to his own house at Bath, for quiet examination of the fossil remains in it; the results of which examination he detailed, illustrating his remarks with the specimens obtained. Several specimens of a Permian and carboniferous fossil, chonetes, were soon found; also, several masses of entomostraca (little water fleas, &c.); but the most remarkable organism was a chonodont, which had only previously been found in the Ludlow bone bed. What chonodonts were was a disputed point, some authorities considering them as jaws of fish, others as dermal scales, and others again as crustaceans. Mr. Moore then stated that certain mineral veins in Yorkshire had been under the ocean, and had organic remains deposited therein, among which were chonodonts of these very species—hence the inference was almost certain that these lead veins in Yorkshire and the Patchway beds were contemporaneous. A list of the fossils found was then given, many of which were very remarkable, and the author concluded an able paper by re-

viewing the arguments on both sides as to whether these Patchway beds belonged to the upper carboniferous limestone, or the Permian, and stated, as his conclusion, that though he should be very glad to make them Permian, he was convinced, from the fish remains especially, that they were carboniferous.

A discussion took place, in the course of which Mr. Stoddart suggested that this remarkable collection of fossils of different periods into one bed might have resulted from the denudation, or wearing down by the agency of water, of older beds, and thus organisms of different geological ages might have been washed together and cemented. It was remarked that chonetes were a very variable fossil, and that the real point at issue was the identification of the chonodonts, on which Mr. Moore said he was perfectly satisfied.

Mr. Edward Collens, assistant in the Mining School Laboratory, then made a communication upon some improvements in Dr. Mohr's burette. The burette was an instrument increasingly used in analytical chemistry for delivering measured quantities of solutions of known strength for testing purposes, as, for example, the determination of the amount of organic matter in air or water, by a solution of permanganate of potash. Briefly describing Gay Lussac's and the English forms of burette, the author exhibited Dr. Mohr's, which consisted of a graduated tube, open at each end, to the narrow end of which was attached a piece of caoutchouc tubing, which was closed by a spring clamp, termed a pinch-cock. By pressing this, the flow of the test liquid was regulated. It was found, however, that many solutions acted chemically on the india-rubber tubing, and it occurred to Mr. Collens that the pinchcock might be made to act upon the ingress of air as well as the egress of fluid, and he therefore transferred the elastic tube and pinchcock to the top of the burette (bringing the cock itself to nearly its old position, for convenience in working, by glass tubing), and then found that no liquid dropped from the lower and now freely open end of the burette, until the pinchcock was opened to let air in at the top, and the test liquid, passing out through glass only, was delivered quite pure. The minor advantages of the arrangement were immunity from dust and from contact with air, and hence there was no loss by evaporation of the test liquid.

Mr. Stoddart and Mr. W. L. Carpenter, as practical chemists, both thought the improvement highly ingenious. Mr. Carpenter considered it theoretically perfect if one practical difficulty, viz., the leakage of air, could be overcome; and he then explained the French metrical system of weights and measures in use by all chemists, which it had often been proposed to introduce into England, with modifications, in place of the numerous absurd scales in use at present.

The President then called the attention of the meeting to some remarkably fine crystals of quartz exhibited by a member, and briefly explained their mode of formation (a six-sided pyramid on the top of a six-sided prism), as well as the cause of the striation on their surface; after which the meeting separated.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the "BRISTOL DAILY POST" *of March 7th*, 1864.

Last Thursday evening this society held its usual monthly meeting, the sixth of this session, and, notwithstanding the incessant rain, the attendance was very large—about 50 members and 25 visitors, including several ladies. After the usual formal business, the president, Mr. W. Sanders, announced the election of Mr. J. W. Clarke as a member, and then called the attention of the members to the Apteryx, purchased by the society at the previous meeting, for presentation to the museum of the institution, which was now upon the table, neatly set up as a specimen. He then mentioned the fact reported in the *Daily Post* of March 2, of a microscope, supposed to have been stolen, having come into the possession of the police, but no member claimed the instrument.

Mr. W. W. STODDART, the hon. treasurer of the society, then delivered a discourse, entitled "A Naturalist's walk near Bristol." As an apology for so soon intruding himself again upon the notice of the society, the speaker stated that he had of late been engaged in the preparation of photographs of objects of natural history, suitable for exhibition by the oxyhydrogen light, for illustrating lectures, &c. Photographs of this kind were also sold by Mr. Highley, of London, but were not so successful as those Mr. Stoddart had obtained, and he considered it right to offer them first to the inspection of the Naturalists' Society (applause). After descanting upon the great beauty of the suburbs of Bristol, whether east, west, north, or south, and the great variety of plants to be found in the neighbourhood, owing to the different geological beds, each forming its own soil, and hence each having plants growing upon it peculiar to itself, as the geranium tribe on limestone, the ferns on new red sandstone, the chicory on the lias, and other instances, the speaker said that many people in taking a walk passed over many most interesting things, simply because they were common, and he thought it a disgrace to Bristol that there was no published flora and fauna of the neighbourhood; such a book it should be the special duty of such a society as this to furnish materials for. The first point illustrated was Narroway-hill, where the new red sandstone contained remains of a large reptile, the Labyrinthodon, a photograph of which, as restored at the Crystal Palace, was shown. The lias epoch, beds of which were exposed on the South Wales Union Railway, was then dwelt upon, the remarks being illustrated by many excellent photographs of the huge reptiles then existing, as well as of ammonites, nautili, and many other animals, especially the Crinoidea. In a field near here was a remarkable bed, about five inches thick, containing great numbers of jaws of the Echinus, or sea-urchin; also, growing near, the rare fern, Botrychium. Passing on to the Boiling-well, to which extraordinary healing powers were once ascribed, several marshy plants were found, and a rare snail, Helix sericea. Ashley brook was a

BRISTOL NATURALISTS SOCIETY.

From the "BRISTOL DAILY POST" *of April* 11*th*, 1864.

The seventh meeting of this session was held on Thursday evening last, when upwards of eighty members and friends, including several ladies, attended, and Mr. William Sanders, the president, occupied the chair.

The usual routine business having been gone through, Mr. A. LEIPNER, the honorary secretary, explained a scheme which he had devised for a systematic registration of the objects of natural history, in the widest sense of the term, in the neighbourhood of Bristol, in such a manner that the work done by the various members might be collected and systematised, with a view to the ultimate publication of a complete flora and fauna of the Bristol district, a wish for which had often been expressed, and which was a work especially suited for such a society. Mr. Leipner detailed at some length the manner in which each and every contributor would have his full share of acknowledgment for his labours, however small, and, consequently, also of responsibility, for the accuracy of his statements. The scheme embraced, besides, a plan for utilising the labours of the past, in the shape of the various collections in possession of members or their friends, provided the locality and year of discovery were given; and Mr. Leipner stated that he thought a fundamental rule should be that, of such animals, only such should be recorded as were found living; of plants, only those found growing; and of geological and mineralogical specimens, only such as were found *in situ*. Mr. Leipner concluded by proposing the four following resolutions, which, after some discussion, were carried unanimously :—

1. That the members of the Bristol Naturalists' Society undertake to register all the objects of natural history found by them, with a view of publishing the result.

2. That the society intends to extend its operations over the Bristol coal-field.

3. That the locality where the object is found shall be given in the number of the square mile on a map to be thus divided, instead of the usual one of the town or village.

4. That the expenses for printing the papers for registration, as well as the maps required, shall be defrayed from the funds of the society, unless paid for by the members requiring them.

Mr. W. LANT CARPENTER, the hon. reporting secretary, then read a short paper on "The soluble glass used in the decorations of the houses of Parliament." Soluble glass was a silicate of soda, or of potash, or of both, entirely soluble in water, thereby differing from ordinary glass, which was a silicate of soda and lime. The solution of this "water glass" was used for a great many purposes,—one application was in a new kind of fresco painting, invented by a German chemist, Dr. Fuchs, and now practised largely in this country, as well as at Berlin. In the old frescoes, the colour was laid upon a fresh damp surface of mortar. In this mode, called stereochromy, the colours were laid on a dry wall, the surface of which was then covered with a solution of this water glass, which gelatinised there, forming a protective coating, and eventually a silicate of lime, by its action on the mortar. The advantages of this mode of painting, to the artist, were very great. At the request of

Mr. J. B. Atkinson, the author had analysed some of the water glass imported from Berlin, and used by Mr. Maclise and others in fixing the frescoes at the houses of Parliament, and had found it to consist of a silicate of soda and potash, with rather an excess of the alkalies, and twelve per cent. (on the dry salt) of alkaline sulphates, chlorides, and carbonates; the presence of which he considered rather prejudicial than otherwise, as liable to cause an efflorescence on the surface of the picture. This paper was illustrated with a collection of the materials and colours used in stereochromic painting, kindly lent by Mr. Atkinson; and the author stated, in conclusion, that one object he had in view was to give an example of the short papers, occupying but a few minutes, which the society wished to encourage, and which were very much wanted.

The last paper read was by Mr. Charles Groome, on the nidification of British birds. Out of 8000 species of birds known, 320 visited Britain, and 187 bred here. The present paper was confined to the birds of prey, the flycatchers, and the thrushes. The golden eagle, found occasionally in Scotland, laid three eggs, towards the end of March, of a dirty white colour, and hard stony shell, in a nest of often 20 years' accumulation, frequently lined with lambskin. The fishing hawk, a very rare bird, breeding near Loch Awe, had an enormous nest—weighing half a ton. The peregrine falcon, bred on the cliffs of the coast, and the hobby falcon generally selected a magpie's nest. The kestrel hawk was bred in every county in England, and the author showed six magpie's eggs taken from a nest, which was in a week's time usurped by one of these birds, the eggs laid by which were also shown. The kite, which once built in the streets of London, constructed a flat nest of sticks, dry grass, &c., and laid in April or May. The buzzard, which was becoming rare, built a large nest of sticks. The eggs of birds a year old were five in number and white in colour, while the older birds laid four eggs more variously marked. This law of colour in the eggs, appeared to run through all the birds of prey. Several birds, fast becoming very scarce, as the honey buzzard, the marsh and hen harriers, the montagues, &c., were then spoken of, and lastly the owls. The common barn owl remained all the year in the period of incubation, laying two eggs, and when they were ready to hatch, another two, and so on, so that six young birds of different ages, in pairs, were frequently found in an owl's nest. This paper was illustrated with specimens of nests and eggs from Mr. Groome's magnificent collection.

In moving the thanks of the society to the author of that evening's papers, the president said he could not allow the meeting to adjourn without alluding to the loss the society had sustained by the death of the Rev. William Pippett, whose constant courtesy and scientific attainments had made him loved as well as respected by those members of the society who had been fortunate enough to become acquainted with him.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the "BRISTOL DAILY POST" *of May 9th*, 1864.

The second annual meeting of this society was held at the Philosophical Institution on Thursday evening, May 5th; Mr. W. Sanders, president, in the chair.

The minutes of the last meeting having been read and passed, the honorary secretary announced the election of several new ordinary members, as well as of Professor Phillips, Dr. A. Gunther, and Mr. J. A. Power, as corresponding members; letters from whom were read.

The report of the council was then read by the honorary secretary. We make the following extracts:—

"Your council have great satisfaction in announcing the steady scientific progress and the continued financial prosperity of the Bristol Naturalists' Society. The proceedings of the past year fully justify the most sanguine expectations of all friends and supporters of the society, and offer every encouragement and assurance for the future. The society numbers, at the completion of this its second year, not less than 214 ordinary and 15 corresponding members. This considerable increase in the number of members is rendered still more significant by the regular attendance at the monthly meetings. Referring to the changes in the organisation of the society, made at the first annual meeting on May 8th, 1863, your council think it just to call attention to the condensed abstracts of papers and debates prepared for publication by your honorary reporting secretary, as they indicate the desire and intention of the society to gain, by serious and sustained efforts, a public position as a scientific body, and to maintain the just claims of the several contributors to a deserved public reputation as the fruit of their industry. With respect to the obligations of the society to the Philosophical Institution, it will be sufficient to put on record the fact that every evening meeting of the society, as well as the meetings of the council, have, up to the present time, been held in this theatre, and that during this second year the obligations have been rather increased than diminished by the permission so liberally accorded to make use of the museum and other accommodations of the institution."

Passing to the transactions of the present year, the report gave a brief outline of the ordinary and excursion meetings of the society, notices of which have regularly appeared in these columns; after which, it proceeded thus:—"Your council feel, moreover, that the society may now take another and very important step in its onward career, and to this they would beg to direct especial attention. In the April meeting of this year, your honorary secretary expressed his views and wishes in regard to the accomplishment of a complete history of the geology, palæontology, mineralogy, botany, and zoology of our locality, and, as far as might be possible, its entire natural history, including the highest and lowest forms of animal and vegetable life—a work of such large dimensions, and requiring such assiduous labour as can only be surmounted by the combined and continuous efforts of many naturalists qualified by previous experience and exactitude of knowledge in various departments; a work, however, worthy of their united powers, and offering great opportunities and a high reward. It must be a source of just pride to the society that it can feel able as well as willing to undertake so important a work, and that it can look forward with confidence to its completion in due time. The society has, however, fairly committed itself to this undertaking, with full faith in the powers of many distinguished members, and with the praiseworthy determination to carry out their resolve to the best of their ability."

The report then expressed the recommendation of the council that in consequence of the increased work which had devolved upon them, their number should be increased to nine, besides the officers of the society, and proceeded:—"In conclusion, your council ventures to express its hearty

appreciation of the admirable spirit which animates the whole body of members, and its conviction of the efficient practical working of the society. It also cherishes the hope that the society generally entertains the same gratifying impression of the successful results attained, and the same strong conviction of a highly prosperous future."

The Hon. Treasurer (Mr. W. W. STODDART) then read the audited accounts, which showed a balance of cash in hand of £31 5s. 5d., and arrears of subscriptions to the amount of £42 10s., making a total of £73 15s. 5d. in favour of the society.

Mr. C. GROOME moved, and Mr. S. H. SWAYNE seconded, the adoption of the report and accounts, and the motion that they should be printed, together with a list of the officers and members of the society, was carried unanimously.

Dr. BEDDOE moved the presentation of the apteryx (lately purchased by the society) and a donation of ten guineas to the museum of the institution, with a vote of thanks to the institution committee. He observed that the accommodation enjoyed by the society was most cheaply purchased, and that, in fact, this donation was little more than a transference of money from one pocket to another, as the society and the institution had so many objects in common.

Mr. F. P. LANSDOWNE seconded the resolution, which was carried *nem. con.*

Mr. RAVIS then moved that the alteration of rule 3, recommended by the Council, be adopted, and that the rule be altered to the following form:—"That the management of the society be vested in a Council, consisting of a president, two vice-presidents, two secretaries, and a treasurer, to be elected annually, together with nine ordinary members, of whom three shall retire annually, to be replaced by three other members of the society."

Mr. BARTON seconded the resolution.

Mr. DERHAM moved, and Mr. PRAEGER seconded, the reelection of Mr. Leipner as hon. secretary, Mr. W. L. Carpenter as hon. reporting secretary, and Mr. W. W. Stoddart as hon. treasurer.

The meeting was then proceeding to ballot, by voting papers, for a president, when it was moved, in eulogistic terms, by Dr. BEDDOE, seconded by Mr. HAWKINS, and carried by acclamation, that Mr. William Sanders be requested to retain the office he had so worthily filled since the foundation of the society.

Mr. SANDERS, in returning thanks, said that he could not but feel it an honour to preside over a society which had gone through two years of good work, and which was constantly adding to the number of its members, showing that the society and its proceedings had obtained the approbation of the public generally. The duties he performed with pleasure, as he was materially aided by the very efficient co-operation of the other officers.

The following gentlemen were then elected by ballot:—Vice-presidents, Rev. Canon Moseley, Mr. Thomas Pease; Members of Council, Mr. S. Barton, Mr. S. H. Swayne, Mr. F. V. Jacques, and Mr. H. Thomas.

The HON. SECRETARY then announced that the first excursion for the season would take place in connection with the meeting of the Agricultural Society on June 17th, and, for various reasons, would be along the Port and Pier railway to Shirehampton, going over much the same ground as in the last excursion.

Mr. PRAEGER proposed, and Mr. HALSALL seconded, a vote of thanks to the Council and officers of the society, which was briefly acknowledged on their behalf by the President, after which the meeting separated.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL

Naturalists' Society.

ESTABLISHED 1862.

REPORT OF THE COUNCIL,

READ AND ADOPTED AT THE

SECOND ANNUAL MEETING

OF THE SOCIETY,

HELD MAY 5TH, 1864,

WITH

THE RULES, LIST OF OFFICERS, AND LIST OF MEMBERS.

CLIFTON: MARDON AND CO., ROYAL PROMENADE.

LIST OF OFFICERS,

AS APPOINTED AT THE ANNUAL MEETING, MAY 5TH, 1864.

PRESIDENT:

WILLIAM SANDERS, F.R.S., F.G.S.

VICE-PRESIDENTS:

REV. CANON MOSELEY, M.A., F.R.S., INSTIT. SC. PARIS. CORRESP.
THOMAS PEASE, F.G.S.

MEMBERS OF THE COUNCIL:

JOHN BEDDOE, M.D.
SAMUEL MARTYN, M.D.
S. H. SWAYNE, M.R.C.S
WILLIAM J. FEDDEN.
HENRY E. FRIPP, M.D.
WM. B. HERAPATH, M.D., F.R.S.
STEPHEN BARTON.
F. V. JACQUES.
HERBERT THOMAS.

TREASURER:

W. W. STODDART.

HONORARY SECRETARY:

ADOLPH LEIPNER, 22, UPPER PARK STREET.

HON. REPORTING SECRETARY:

WILLIAM LANT CARPENTER, B.A., B.Sc.

REPORT.

Your Council have great satisfaction in announcing the steady scientific progress and the continued financial prosperity of the Bristol Naturalists' Society. The proceedings of the past year fully justify the most sanguine expectations of all friends and supporters of the society, and offer every encouragement and assurance for the future.

The society numbers, at the completion of this its second year, not less than 214 ordinary, and 16 corresponding members. This considerable increase in the number of members is rendered still more significant by the regular attendance at the monthly meetings, which have maintained their high scientific character by a succession of papers of great interest and variety, as also by the animated discussions which have taken place on several occasions.

The out-door gatherings on appointed excursion days have likewise been distinguished by the lively interest and pleasure, with which the members have attended in spite of unfavourable weather.

The present report naturally commences with a reference to the minutes of the first annual meeting on May 8th, 1863. In making its first retrospect, and passing in review the transactions of its first year of existence, the society was enabled to consider, in detail, its past operations and results. Whilst noting with approval all that had borne the test of actual practice, the opportunity was taken to make such changes in organisation and management as appeared advisable.

The advantage of such a retrospect has been amply proved by the experience of the present year. Amongst other improvements

the society cannot fail to have recognised the great importance of the admirable abstracts of papers and debates prepared by your honorary reporting Secretary, Mr. William Lant Carpenter, for the use of members, and for publication in selected scientific journals. Your Council think it just to call attention to these condensed abstracts, as they indicate the desire and intention of the society to gain, by serious and sustained efforts, a public position as a scientific body, and to maintain the just claims of the several contributors to a deserved public reputation as the fruit of their industry and study.

Referring to the minutes of the meeting on May 8th, 1863, we find after the adoption of the report then presented, the re-election of officers and the appointment of Mr. Wm. Lant Carpenter as Honorary Reporting Secretary, that the next business entered upon was a recommendation of your Council to enlarge its numbers by the addition of members elected from the general body. This recommendation was discussed, accepted, and acted on, and Rule III altered to its present form in accordance with this change. Your Council have a further recommendation to offer in reference to the number of members composing the Council, which will be explained and commented on in a later paragraph of the present report.

The next important minute of the annual meeting, related to the contribution offered by the society to the Museum Fund of the Philosophical Institution. It can scarcely be necessary to insist on the obvious advantages, which the Naturalists' Society derives from its connection with an Institution, which has mainly represented science in Bristol, and given it a local habitation as well as a name for the last 40 years. It will therefore be sufficient to put on record the fact, that all meetings of the society, as well as those of the Council, have, up to the present time, been held in this theatre, and that the obligations of this society have, during the second year of its existence, rather increased than diminished by the permission so liberally accorded to make use of the Museum and other accommodations of the Institution. Nor is it to be forgotten, that the contributions of our society to the Museum of the

Bristol Philosophical Institution constitute one of the most efficient means of carrying out objects and principles identical with those which the society has in view. Without enlarging further on this subject, your Council feel, that they may confidently leave in the hands of the society the proposal of a second grant of Ten Guineas to the Museum Fund of the Institution. It is also recommended, that the vote of thanks to the Committee of the Institution for the use of their building, should be accompanied by the presentation of the lately-purchased specimen of "Apteryx," as a fitting contribution to the collection of natural objects in the Museum.

In respect to the transactions of the second year, a brief outline of the several excursions and meetings will offer many points worthy of notice in this report.

The excursions, four in number, took place in the order following:—In the month of June, a trip was arranged to Clevedon by rail, thence on foot to Walton Castle, and along the hill returning by the sea-side to Clevedon. The Rev. G. W. Braikenridge communicated to the party a botanical history of the locality, and the President, Mr. Wm. Sanders, explained the geological phenomena most worthy of notice in the course of the walk.

The second excursion in July, had for its object the examination of the deep cutting near Patchway, on the line of the S.W. Union Railway, on which occasion Mr. Charles Moore of Bath favoured the party with his company, and collected the materials for a paper read by that gentleman at one of the meetings.

The next expedition in August, was directed to the Lias Quarries of Keynsham, and the great fault in the stratification of Bitton-hill. The objects of the party were successfully accomplished under the guidance of the President, Mr. Sanders.

In September, a party again assembled, undeterred by the very unfavourable weather experienced on two of the three previous excursions, to explore the fossil beds of the limestone formation on the banks of the Avon from the Hotwells to Sea-Mills, and to obtain from the marshes below Shirehampton certain botanical specimens.

This excursion formed an agreeable close to the series of summer meetings.

On the 1st of October, the society resumed its evening meetings at the Institution.

The question of election of new members was discussed at this meeting, and the future management and responsibility of the elections transferred to the Council,—the time of the meeting being thus devoted to the scientific engagements of the evening. The Council were further empowered to invite the attendance of ladies on suitable occasions.

Mr. Charles Ravis read a paper on the Natural History of Amber, and Mr. Hugh Owen communicated an interesting discovery by Mr. Jonathan Couch of an open tube leading from the ear to the air-bladder of certain fishes, analogous to the eustachian tube in the higher animals.

In November, Mr. W. W. Stoddart read to a large audience (including ladies amongst the visitors) an account of the tea-plant, its properties and adulterations.

At a very full meeting in December, Dr. Beddoe gave an account of the Maori race of New Zealand, and Dr. Joseph Swayne exhibited portraits drawn by himself of the chiefs of that race, lately resident in our city. Mr. Charles Ottley Groom also made observations on the cranial characteristics of the aboriginal New Zealanders. On the same evening, Mr. Frederick Martin exhibited a collection of specimens illustrating the Marine Zoology of Clevedon, and read a paper descriptive of them.

At the January meeting, Dr. Samuel Martyn read a paper describing two species of Holothuridæ, known in the commerce of the Chinese waters under the name of Trepang, and used there as an article of food. Specimens, drawings, and chemical demonstrations accompanied the paper. Mr. Henry Swayne then read a paper on "Anthropoid Apes," illustrated by examples selected from the Museum.

At the February meeting, a proposition of the Council was made

to the society to purchase a specimen of a rare bird (Apteryx) for the Museum. Mr. Leipner gave a short account of this bird, and the recommendation of the Council was adopted. Mr. Moore of Bath then read a paper entitled "Results of a geological ramble to Patchway," illustrated with specimens. On the same evening, Mr. Collens exhibited an improved Burette for the purpose of volumetric analysis, which obtained the approval of several gentlemen experienced in that department of practical chemistry.

On March, the 3rd, a numerous attendance of members and visitors demonstrated the increasing attraction of the society's meeting. The new purchase (a fine specimen of Apteryx) was exhibited, after which Mr. Stoddart displayed a series of illuminated photographs of objects illustrating the natural history of our locality, and described the objects exhibited in his account of "A Naturalist's walk."

The concluding meeting of the winter session was occupied by Mr. William Lant Carpenter's descriptive account of the material called "waterglass," used in modern fresco painting, with a detailed analysis of a specimen of the material used for the decoration of the new houses of parliament. Mr. Chas. O. Groom read a paper on the "nidification of a few birds that breed in Britain."

This cursory notice of the many interesting excursions and meetings of the society during the past year, may suffice to give a general and connected view of its scientific transactions. The details having been rendered familiar to all our members by the regularly printed abstracts, do not require to be further dwelt on. Your Council cannot however refrain from pointing with the liveliest satisfaction to these evidences of sound and steady advance to a high, scientific position, which must be a matter of earnest congratulation to all concerned.

They feel, moreover, that the society may now take another and very important step in its onward career, and to this they would beg to direct especial attention.

In the April meeting of this year, your Hon. Secretary expressed

his views and wishes in regard to the accomplishment of a complete History of the Geology, Palæontology, Mineralogy, Botany, and Zoology of our locality, and as far as might be possible, its entire collective natural history, including the highest and lowest forms of animal and vegetable life. A work of such large dimensions, and requiring such assiduous labour, can be surmounted only by the combined and continuous efforts of many naturalists qualified by previous experience and exactitude of knowledge in various departments; a work however worthy of their united powers, and offering great opportunities and a high reward. It must be a source of just pride to the society that it can feel *able* as well as willing to undertake so important a work, and that it can look forward with confidence to its completion in due time. The society has however fairly committed itself to this undertaking with full faith in the powers of many distinguished members, and with the praiseworthy determination to carry out their resolve to the best of their ability. At the last meeting, your Council was entrusted with the arrangements necessary for working out this scheme, and preparations are already being made. A careful study of details is however requisite, and the amount of work before the society appears to increase daily as each detail passes under consideration.

Under these circumstances, it seems to the Council that there is a necessity for strengthening its hands by the addition of members. According to Rule III, two of the present members retire, to be replaced by newly elected members. It is not proposed to set this Rule aside; on the contrary, the election of additional members will form one of the first things to be done after the election of President, Vice-Presidents, Treasurer, and Secretaries. But it is believed that under the present press of work, the Council might advantageously consist of nine members instead of six. One of the Council (Mr. Hugh Owen) has left our neighbourhood, so that by rule, one member only would have to retire. The arrangement by which the retiring members are to be distinguished from those remaining on the Council is, as will be seen by referring to Rule

III, left indeterminate, and though a matter of minor importance, this creates a momentary difficulty, inasmuch as the full period of office secured to all members of the Council after the first two years will not have been enjoyed by those first retiring. It is proposed to remedy this omission by adopting the plan of retiring by lot for the next three years, after which, those remaining will have passed through the regular term of office, and retire by rotation.

Your Council is inclined therefore to recommend the following as the best mode of procedure for the present year, namely:—To fix the number of ordinary members in council at nine, (three to retire annually) and to make this number good for the present year by electing four new members who, with the five remaining ordinary members of your Council, will form, together with the President, Vice-Presidents, Treasurer, and Secretaries, the Council for the current year.

In conclusion, your Council ventures to express its hearty appreciation of the admirable spirit which animates the whole body of members, and its conviction of the efficient practical working of the society. It also cherishes the hope that the society generally entertains the same gratifying impression of successful results attained, and the same strong conviction of a highly prosperous future.

There remains only one duty to be performed before resigning into the society's hands the several offices of President, Vice-Presidents, Treasurer, and Secretaries,—namely, the reading of the audited accounts by the Treasurer.

It may be right also to remind the members present, that as far as the order of business for the evening is prescribed by the rules of the society, the first point requiring attention, will be the election of of gentlemen to fill the vacated offices.

W. W. STODDART *Treasurer, in Account with* THE BRISTOL NATURALISTS' SOCIETY.

INCOME AND EXPENDITURE.

Dr.

		£	s.	d.
1864.				
	To Balance brought forward	43	14	5
May 27.	To Subscriptions actually received to this date	35	15	0
		£79	9	5
	To Balance brought forward	£31	5	5

Cr.

		£	s.	d.
1863				
May 18.	By Cash paid Institution	10	10	0
July 22.	,, Expenses at July Excursions per Secretary	0	13	6
Oct. 9.	,, Mardon & Co., Stationers	3	0	6
12.	,, Somerton & Co., Printers	0	5	0
1864.				
Jan. 13.	,, Somerton & Co., Printers	0	10	0
Apl. 14.	,, Sending Notices, Gratuities, and other Expenses per the Sec.	15	9	7
16.	,, Mardon & Co., Stationers	10	15	5
,,	,, Charbonnier, for *Apteryx*	7	0	0
	By Balance in hand	31	5	5
		£79	9	5

April 27th, 1864. To Arrears of Subscriptions payable on January 1st, 1864 .. .. £42 10 0

Audited May 2, 1864,

STEPHEN BARTON,

THOMAS HAWKINS.

RULES.

—o—

I.

That this Society be called the BRISTOL NATURALISTS' SOCIETY, and that its object be—the communication of new and interesting information on objects connected with Natural Science.

II.

That the Society consist of Ordinary and Corresponding Members; that the number of members be unlimited.

III.

That the management of the Society be vested in a Council, consisting of a President, two Vice-Presidents, two Secretaries, and a Treasurer, to be elected annually, together with nine Ordinary Members, of whom three shall retire annually, to be replaced by three other Members of the Society.

IV.

That the Society meet at the rooms of the Bristol Philosophical Institution on the *first* Thursday in every month. That the Members be summoned for, and the chair be taken at half-past seven o'clock, p.m. That the President be Chairman at the meetings of the Society, or in his absence one of the Vice-Presidents, or in case the Vice-Presidents be also absent, then the meeting may choose a Chairman from among the Members present.

V.

That the Secretary be required to send a notice of each Meeting to every Member not later than the previous Monday; that such notice contain "Proposed alterations of rules," and "Subjects for the evening."

VI.

That the Council be expected to provide subjects for the evening; and that any member desirous of making a scientific communication be requested to give notice beforehand to the Secretary

VII.

That the author of each communication write an abstract of it on paper of an agreed uniform size, to be placed in the Abstract Book of the Society; and that the Secretary send a short account of each meeting to some suitable journal for publication.

VIII.

That each member be at liberty, with the Chairman's permission, to introduce a friend at any monthly meeting, subject to his withdrawal in case of private business having to be transacted.

IX.

That all Ordinary Members subscribe Five Shillings per annum towards defraying the expenses of the society; the subscription to commence at their entrance, and to be renewed on the first meeting in January.

X.

That the Members of the Bristol Philosophical and Microscopic Societies desiring to become Members of this Society, may, upon written application, be so entered. That the Name, Address, and Occupation of any Candidate for admission, be sent in writing to the Hon. Secretary, signed by the proposer and seconder, be brought before the next meeting of the Council for their decision, and that the Names of Members so elected, be announced at the meeting of the Society next ensuing.

XI.

That the Secretary be required to give to every new Member notice of his election, and a copy of the Rules.

XII.

That the Council arrange two or more Excursion-meetings, to be substituted for the ordinary monthly meetings, in the course of the Summer.

XIII.

That the annual meeting be held on the first Thursday in May, at which time the various officers be elected.

XIV.

That at the meeting next preceding the annual meeting, two Members shall be appointed to audit the accounts; and that at the annual meeting, the audited general account of the Society shall be read by the Treasurer.

XV.

That any new rule may be made, or any existing rule repealed or altered at any meeting, on motion duly made and seconded, if carried by two-thirds of the Members present, but subject to be confirmed by a like majority at the next succeeding meeting, except in the case of rules passed at the annual meeting, when subsequent confirmation shall be dispensed with; the intention to propose any such alterations or new rules having been notified in the summonses.

LIST OF MEMBERS.

Frederick Ashmead
J. Beavington Atkinson
Clement Baber
William F. Badock
J. Barber
Francis K. Barnes
John Perry Barton
Richard C. Beddoe
William Benham, LL.D.
Ralph M. Bernard, F.R.C.S.
William Berry
James Bigwood, Jun.
Francis P. Bisson
Henry Bolt
John Bolt
Charles Boorne
Rev. G. W. Braikenridge, M.A., F.L.S.
Alfred Brittan, B.A.
Frederick Brittan, M.D.
Samuel Woolcott Browne
Thomas Bucklee
John Payne Budgett
W. Hill Budgett
George Forster Burder, M.D.
Wm. Corbett Burder, F.R.A.S.
Alfred Burleigh, M.R.C.S.
Cephas Butler
Rev. J. W. Caldicott, M.A.
William G. Carter, M. D.
Thomas S. Cayzer.
J. P. Challacombe, M.D.
John Moss Chandler, L.S.A.
Henry Charbonnier
Theodore Charbonnier
Thomas Edward Clark, M.R.C.S.
William Clark
J. W. Clarke
W. Michell Clarke, M.R.C.S.
T. C. Cole
John Colthurst, F.R.C.S.
Thomas Coomber
Handel Cossham, F.G.S.
James M. Crichton, L.R.C.S.
Charles Dando
James George Davey, M.D.
David Davis, M.R.C.S.
Alfred Day, LL.D.
James Derham
Samuel Derham
Edwin Down
Charles Bortill Dunn
William Evans
John T. Exley, M.A.
W. B. Fegen, M.R.C.S. Surgeon R.N.
Walter Fiddes
Rev. W. F. Fisher
Charles Henry Fox, M.D.
Charles Joseph Fox, M.D.
Edward Long Fox, M.D.
Edwin F. Fox, M.R.C.S.

William Frayne
Rev. I. Sadler Gale
George Gardiner, M.R.C.S.
Edward James Gibbon
Richard William Giles
Henry H. Goodeve, M.D.
Rev. F. W. Gotch, LL.D.
J. Mortimer Granville, L.R.C.P.
Charles Greig, M.R.C.S.
Samuel Griffith
Charles Ottley Groom
Thomas Grundy
Rev. Canon Guthrie
Edward Halsall
T. G. Rice Harding
George Harding, Jun.
Edward Harvey
Jas. Joseph Harvey
John Harvey, Jun.
Thomas Hawkins, M.R.C.S.
S. Hayman
Cam Gyde Heaven
Clement Higgins
Edward T. Higgins, M.R.C.S.
William Higgins
Charles Highett, L.R.C.P.
James Highett, M.R.C.S.
J. Hosking
Thomas Howard
A. E. Hudd
Charles T. Hudson, M.A.
Henry Husbands
John Pim Jackson
Rev. William James
William James
Evan John
Henry Johnson
Rev. Robert Crompton Jones, B.A.
John Keal
Thomas Kerslake
William Poole King
Mervyn King
T. E. Lamotte
Robert Lang
F. Poole Lansdown, M.R.C.S
John Linton
Stephen Little
Isaac Lloyd
Benjamin N. Lobb
John E. Lunell
Sydenham Malthus
Henry Marshall, M.D.
Frederick Martin
Henry Masters
Joseph Seymour Metford, M.R.C.S.
Alfred R. Miller
John Moore
Frederick Morgan
J. W. Morris
A. Mosely
H. N. Moseley
Louis Naish
Alfred Noble
E. C. Nunn
William Ormerod, M.R.C.S.
Henry Andrewes Palmer.
C. George H. S. Pattrick
George John Parker, M.R.C.S.
G. J. Parker, Jun.
James Gage Parsons, L.R.C.P.
Thomas Cooke Parson
Thomas Cooke Parson, Jun.
Alfred C. Pass.
William Pearce

William Peck
James Phillips
William Pockson
Rev. Nicholas Pocock
William Polglase
Archibald C. Ponton
Thomas Graham Ponton
Charles Pooley, M.R.C.S.
Thomas Pope
Emil Arnold Præger
Arthur Prangley
Augustin Prichard, F.R.C.S.
J. B. Prowse, M.R.C.S.
Charles F. Ravis
Edwyn C. Reed
Rev. H. Seymour Roberts, LL.D.
George Rogers, M.D.
John Robert Rogers
Rev. W. W. Rowley
John Naish Sanders, F.G.S.
Joshua Saunders
Thomas Sawer, M.R.C.S.
Frederick Schacht
William Y. Sheppard, M.R.C.S
Philip R. Sleeman, F.R.C.S.
J. S. Smart
Charles Smerdon, M.R.C.S.
Alfred Smith
G. M. Stansfeld
Joseph G. Swayne M.D.
Augustus Talbot, M.R.C.S.
Henry Tanner
James Tanner
William Terrell
Charles Thomas
Thomas Thomas
Richard Thomas
William Tothill, Jun.
Henry H. Townsend
John Henry Townsend
John Henry Tucker
Francis F. Tuckett
Thomas Turner
J. P. Tylee
Philip Henry Vaughan
William B. L. Walcott
Thomas Todd Walton
T. Webster, M.R.C.S.
Andrew Weston
Joseph Wethered
Fred. Henry Whitfeld
Rev. W. Whiting
Mark Whitwill
Frederick Wills
Samuel Wills
William Henry Wills
George Martyn Wilson
Henry Wilson, M.R.C.S.
J. G. Wilson, M.D.
Rev. W. C. Wollaston
Augustin Woodward
Samuel Worsley
Thomas Henry Yabbicom
Frederick York
F. Graham Young

LIST OF CORRESPONDING MEMBERS.

William B. Carpenter, Esq., M.D., F.R.S., etc., London.

Philip P. Carpenter, Esq., B.A., Ph. D., Manchester.

Robert Etheridge, F.G.S., F.R.S.E., Mus. of Practical Geology, Lond.

J. P. Galienne, Esq., Guernsey.

Albert Günther, Esq., M.A., M.D., Ph.D., F.Z.S., British Museum.

T. Rupert Jones, Esq., F. G. S. Professor of Geology and Mineralogy, Royal Military College, Sandhurst.

Edwin Lankester, Esq., M.D., F.R.S., Kensington Museum, London.

Frederick Layard, Esq,, late of Ceylon.

Charles Moore, Esq., F.G.S., Bath.

Hugh Owen, Esq., Paddington.

Professor John Phillips, M.A., LL.D., F.R.S., F.G.S., Oxford

John A. Power, Esq., M.A. & L.M., Cantab.; M.R.C.P., Lond.; F.R.G.S., London

George E. Roberts, Esq., Somerset House, London

H. J. Slack, Esq., F.G.S., London.

Rev. Frederick Smithe, M.A., F.G.S., Highley Vicarage.

Frederick Smith, Esq., British Museum.

BRISTOL

Naturalists' Society.

ESTABLISHED 1862.

REPORT OF THE COUNCIL,

READ AND ADOPTED AT THE

THIRD ANNUAL MEETING

OF THE SOCIETY,

HELD MAY 4TH, 1865,

WITH

THE LIST OF OFFICERS, AND LIST OF MEMBERS.

CLIFTON: MARDON AND CO., ROYAL PROMENADE.

BRISTOL NATURALISTS SOCIETY.

EXCURSION MEETING.

From the "BRISTOL DAILY POST" *of June 20th*, 1864.

The first excursion meeting of this society for the season was held last Friday, the 17th inst. The members of the Bath and West of England Agricultural Society had been invited to attend, and for the sake especially of these visitors the excursion of last September was repeated. The party, upwards of seventy in number, including several ladies, assembled, for the most part, at the Hotwell-house, and proceeded along the course of the Port and Pier Railway as far as Shirehampton, in order to study the various geological sections laid bare by the cuttings, the interesting features of which were pointed out and descanted upon by the president, Mr. W. Sanders, F.R.S., and the hon. treasurer, Mr. W. W. Stoddart. From the Hotwell-house to the Black-rock the strata belong to the carboniferous series—the fossils in the mountain limestone, as well as the shales, a thin bed of coal, and the millstone grit, attracting much attention. At the Black-rock, a great fault, or displacement of strata, occurred, and the whole series began again. Near the old shooting-ground of the Rifle Corps, the first indications of the Devonian, or old red sandstone group, presented themselves in the form of micaceous scales in the shales. In this field, also, the botanists and entomologists of the party captured several specimens, and here Mr. Stoddart pointed out a small bone bed, about three inches thick, which he had accidentally discovered on a former occasion, as well as some strata containing many fossil entomostraca, or water-fleas. The most curious section, however, was that near the powder-house, where the railway skirts the edge of Kingsweston-park; the beds are contorted, and thrust upwards in the middle, as though by the former action of a disturbing force, and form what is known as an anticlinal curve. These curved strata belong to the old red sandstone series, and lying horizontally on the top of them is a bed of new red conglomerate. After passing beds of red clays and sands, the party left the line of the railway, and passing through Shirehampton, came down into the marshes, where the botanists and microscopic zoologists found many opportunities for adding both to their collections and to their knowledge of the *habitât* of many minute organisms.

At a quarter-past four the whole party re-assembled at Hooper's-hotel, where a cold dinner was provided, but owing to the fact that many members and friends having come without giving notice to the secretary of their intention, considerable difficulty was experienced in providing for all, and the resources of the establishment were taxed to the utmost. Fortunately, however, there was abundance of food, which was done ample justice to, and after the removal of the cloth the President rose, and said it was not the custom of the society to drink toasts after dinner, and very seldom to have any speaking, but they were favoured that day with the presence of a gentleman of great repute among agriculturists, Professor Buckman, late of the Royal Agricultural College, Cirencester, whom he would ask to favour the society with his opinion on the results of that

day's walk. Mr. Sanders then proceeded to give, as requested, a brief geological sketch of the sections passed through that morning, and concluded by calling on

Professor BUCKMAN, who was received with applause. After referring to the fact of his having been secretary for seven years to the Cotswold Field Club, the speaker said that he had met that day with a greater variety of plants than usual in a walk of the same extent, and especially was this the case with the grasses, which were his peculiar study. He considered it very necessary to pay great attention to the varieties and species among grasses, because the kind of grass which grew on any piece of land was a better guide to the agricultural condition of that land than any chemical analysis of the soil, as whatever tended to make poor meadows rich, drove out the poor grasses, the law of extermination holding good with them as with other plants. Although there were about 150 species of grass, it was rare to find more than eight or ten in any one meadow, and yet from a list of the grasses in a field, a practised botanist could tell the nature of the pasture. He also advocated the study of grasses from the wonderful perfection of, and variety in, their forms, although they possessed no beauty of colour; and considering that the greater part of our food in England was derived, in one way or another, from the grasses, he thought that such societies would do much good by directing their attention to the study of this class of plants. The speaker concluded by observing that he should not have trespassed so much on their attention, had it not appeared to him that Bristol had become bucolic all at once, from the great interest she had evinced in the Agricultural Show.

Arrangements had been made with Mr. John Jones, owner of the Fairy Queen steamer, both by letter and personal interviews with the secretary, Mr. Leipner, for the party to return to Bristol by the Fairy Queen, which was to have called at Hooper's slip. We very much regret, however, to have to state that though the two boats were filled with passengers, in readiness for the steamer to call on her way up from Portishead, and the remainder of the party were waiting on the slip, those in charge of the steamer failed in their engagement, and the ladies and gentlemen who had relied on a pleasant voyage home, had the mortification of seeing the Fairy Queen—or, as a witty member of the party proposed to re-christen her, the Vixen—steam calmly up the river, leaving them no resource but to walk back to Bristol as they had walked out, the only fly procurable in Shirehampton being, of course, given up to the most fatigued among the ladies.

We are requested to state that since the annual meeting in May, an entomological section has been formed in the society, and that it is in contemplation to form botanical, geological, and microscopical sections.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

B R

L NATURALISTS' SOCIETY.

R ION MEETING, JULY 8th, 1864.

About forty members and friends, including ladies, joined the second excursion of the season, held on Friday, July 8th. The party left Bristol for Glastonbury by the 9.50. A.M. train, and, on their arrival, proceeded at once to Street, to visit some of the remarkable limestone quarries. The one chosen as an example belonged to Mr. Crees, and had been carefully figured and described by Dr. Wright, of Cheltenham, as a typical example of these lias quarries. The quarry exposes about 20 feet of rock, perpendicularly, and contains 31 separate beds, all horizontal, and of different materials, limestones of various kinds, shales, &c., of thicknesses varying from one to fifteen inches. Halting here, the party gathered round the president, Mr. Sanders, who briefly explained the nature and peculiarities of the beds. He said that they belonged to the Lias, which was the lowest set of rocks of the Oolitic period, and which, in some parts of England, attained a thickness of 700 feet, but near Bristol only 300, of which 100 feet were taken up by the upper Lias sands; then the upper Lias; then beds of clay and marlstone, seen in the excnrsion on Bitton-hill, and then the lower Lias, the beds of which occurred in zones 20 to 50 feet thick, each zone being identified by its own ammonite. Underneath this lay the white Lias, seen at Saltford station, forming a capital building stone; below these were beds of clay and shale, the so-called Rhætic beds, and then the New Red Sandstone. Having thus given the geological position, Mr. Sanders said that this particular quarry was remarkable, as being the one in which so many remains of the extinct saurians had been found, furnishing some of the specimens in the Museums of Economic Geology in London, and the Bristol Institution. The beds belonged to the zone of Ammonites planorbis, and besides furnishing remains of Plesiosaurus, Icthyosaurus, &c, they yielded a shell allied to the mussel, a modiola; an oyster, Ostrea liassica; a lima; the spines of a peculiar echinus, remains of coral, several fish, and a few plants, chiefly ferns.

After examining the beds, the party adjourned to some houses, where the fossils obtained at different times had been preserved, and especially admired some slabs of stone, ten feet square, in the village. This being accomplished, three smaller parties were formed; one, which quietly returned to Glastonbury through the meadows, while a second, under the guidance of Mr. Clarke, a gentleman of the neighbourhood, started for Glastonbury Tor, and on the way were shown a specimen of the lesser auk, shot on the moors, and they also met with Butomus umbellatus, and a Ring-snake, on their return to Glastonbury.

The third, and largest party, including most of the botanists and entomologists, crossed the country to the neighbourhood of Ashcot, and spent a considerable time among the peat bogs, encountering, as a consequence, numerous small and amusing mishaps, caused by the ditches. In answer to several inquiries, it was ascertained that if a place, whence peat has been taken, be left for about 15 years it will appear

at the end of that period as though it had never been touched; the renewal of the peat being probably caused by the sinking in of the surrounding parts, rather than by a new growth. Hence great caution was necessary in assigning ages to articles found in peat at considerable depths. In this region the botanists obtained specimens of the ferns Osmunda regalis and Lastræa thelypteris, the delicate little bog pimpernel, a Drosera or sun-dew, the Eriophorum or cotton grass, the Comarum palustre, and many other plants, several of which were common up to Clevedon. The Sphagnum or bog-moss, in its transition state into peat, was noticed, and many of the pools yielded Chara vulgaris, and other plants interesting to microscopists, with several animalcules; also a fresh-water mollusk, Succinea, allied to the ordinary limnæa. A large marsh-spider was also captured, and a few insects. After spending some time in the pursuit of the many objects of interest afforded them, this party also returned to Glastonbury, along the railway, and the whole having met at the appointed rendezvous, the George hotel, they did ample justice to the dinner which awaited them, and which was very well served up. After dinner, ceremony being, as usual, dispensed with, some of the party returned at once to Bristol, others adjourned to the beautiful ruins of Glastonbury abbey to enjoy a cigar in the grounds, while a third division, more adventurous than the rest, hired a conveyance and drove to Wells to see the cathedral, returning just in time for the 7.20 p.m. train to Bristol. The day was, most fortunately, beautifully fine, and from its varied interests and want of *contretemps*, we think we may safely say this was the most successful excursion ever undertaken by the society.

ENTOMOLOGICAL SECTION.—Chairman: Mr Stephen Barton. Hon. Secretary: Mr. Edwyn C. Reed. Formed May 12th, 1864. To meet on the second Tuesday in each month, at Eight o'clock.

May 24.—The rules of the section were made and other formal business gone through. Mr. I. Barber exhibited Procris geyron Hüb, captured in the Gully, Clifton-down, and Mr. Edwyn C. Reed exhibited a specimen of Calosoma sycophanta, Lin, taken at Ashton; a pair of Asclera sanguinicollis, Fab., taken at Ashton; and Aleochara fuscipes var. lata, Grav, captured freely in Leigh Wood.—June 14.—Mr. G. Harding exhibited as new to the district, Scoparia pallidulalis Gn., and Adela De Geerella Lin.; Mr. A. E. Hudd, Platypteryx hamula W.V., captured at Leigh; Mr. S. Barton, a number of Australian Curculionidæ. The Hon. Secretary, exhibited for Dr. Power, corresponding member, Bembidium Fockii, Hum., of which only six British specimens are known; Stenus Kiessenwetteri, Rosen, new to this country—it has occured in Spain and Bavaria, but is nowhere common; Homolota notha, Er., the second known example; Oxytelus speculifrons, Anobium pusillus Gyll., Cis lineato-cribratus, Mellié, Scydmænus Godarti Latr., and Zeugophora Turneri, Power.

WM. LANT CARPENTER.

Honorary Reporting Secretary.

[B]RISTOL NATURALISTS SOCIETY.

EXCURSION MEETING, Aug. 15th.

From the "BRISTOL DAILY POST" *of August* 19*th*, 1864.

The third and concluding excursion for this season took place on Monday last, Aug. 15. The *locale* chosen on this occasion was the well-known Aust cliff, specially interesting to geologists, from its containing a little bed with peculiar fragments of fossil bones—which has also been discovered cropping out at Axmouth, in Devonshire, and Westbury, places fully sixty miles distant.

On this occasion the number was more limited than usual, only twenty-four members being present, and no ladies. They left by the 12.30 train for the New Passage, and after a slight lunch at the Hotel, walked along the shore in the direction of the cliff. On account of the drought, scarcely any plants of interest were found, and the consequent hardness of the ground prevented the perfect beetles peculiar to such localities from making their way to the surface. The scientific interest of the walk therefore was solely geological. At the distance of a mile, the clearness of the air enabled the various strata to be readily discerned, the cliff presenting the appearance of a coloured geological sectional map. On arriving at Aust, the President, Mr. W. Sanders, F.R.S., F.G.S., gave a description of the strata thus admirably displayed. These comprise the highest beds of the New Red Sandstone, and the lowest of the Lias formation. The red marls at the base support about 10 feet of pale greenish marls, including a six-inch bed of marly sandstone. Resting on these marls the Lias commences with a thin bed containing remains of fish. The next 12 feet consist chiefly of black laminated shales, and they include three thin beds yielding remains of fish, insects, and various bivalve molluscs. The following 25 feet are composed of alternations of thick marly clays, and thin beds of limestone—the highest of which is known as Cotham marble. This portion of the Lias formation has received various appellations: the older Geologists called it the Lower Lias Clays; next, the Avicula contorta beds, that shell being limited to these strata; subsequently it has received the name of Rhaetic beds, on account of its geological affinity with strata which occur in great force near the Rhaetian Alps. At the distance of half-a-mile further along the shore, the red marls presented a thickness of nearly 100 feet, at about 60 feet below the upper limit of which abundance of fibrous gypsum (sulphate of lime) occurs in horizontal layers, intersected by nearly vertical veins and threads: strontian, too, occasionally occurs in this stratum. At this part of the cliff it was observed that the fish bed resting on the pale green marls, which at the southern end of the cliff was seen to be very thin, had gradually expanded to a thickness of eight or ten inches, and consisted of a conglomerate mass of rounded portions of the subjacent marly sandstone, coprolitic nodules, detached vertebræ and other bones of the Plesiosaurus, parts of fish—especially teeth—and some shells. It is this bed which is famous in all text-books on Geology under the name of the Aust Bone-bed.

In the course of the walk, three examples of dislocation of the strata were seen, the nature of the faults was explained, and they were shown to possess all the characteristics of normal faults as they occur in coal-mining. Many of the party worked hard with hammers and chisels, and were fortunate in obtaining good illustrations of the Bone-bed, and other specimens. A portion of a vertebra and other bones of a Plesiosaurus, a spine-bone of a fish, Nemacanthus; teeth of the Ceratodus, Saurichthys, and Hybodus, were found, together with various fossil shells, as Pecten valoniensis, Cardium rhaeticum, Modiola minima, Anatina,

Avicula longispinosa—a very rare shell in this locality—and Ostrea liassica.

On the return to the New Passage, that characteristic phenomenon of tidal rivers possessing a rapid down stream, the bore, or aeger, was well seen, like a perpendicular wall of water about three feet high, advancing up the river. At the New Passage Hotel a most comfortable dinner awaited the party, served up in capital style, and when they had done justice to it, the members returned to Bristol by the 6.45 p.m. train.

We understand that the Council of the Society are endeavouring to form Geological, Botanical, and Chemical sections, for the special advancement and study of these branches of science, and we are also informed that on account of the meeting of the British Association at Bath, and the visit of its members to Bristol in the month of September (preliminary arrangements for which will, be hear, be made at a meeting at the Council-house next Monday), the Council have determined that the first meeting of the session shall take place on the first Thursday in October.

ENTOMOLOGICAL SECTION.

July 12th.—Mr. Stephen Barton, President, in the chair. The President exhibited larva and imago of Hermerius Impar, Newn.; this fine Australian longicorne he obtained by felling an Eucolyptus mannifera, in the Boninyong district. In reply to a question from Mr. G. Harding, Mr. Barton stated that the Australian aborigines would eat any large larva or moth freely, but they were especially fond of the larvæ of the Hepialidæ, or Ghost-moth family.

Mr. John Bolt exhibited a series of Lycaena agestis, W.V., and its varieties, Idas, Haw., Artaxerxes, Fab., Salmaces, Steph., male and female, and an undescribed variety, the upper side of which agreed with the type of the species, but the under side resembled Artaxerxes, Fab.

Mr. J. Barber exhibited ova, larva, pupa, and imago of Meliphora alveariella, Gn., and a variety of Lycaena agestis, W.V.

Mr. G. Harding exhibited a nest of Vespa Norwegica, Fab., which had been built in a gooseberry bush in his garden at Stapleton; this species is somewhat rare in the south and west of England. Mr. E. C. Reed stated he had seen a nest of the same species at Over, this summer.

Mr. Evan John exhibited Lucania putrescens, captured at the Mumbles, and Xylina conformis, taken in Wales.

The secretary, Mr. Reed, exhibited a quantity of Entomological dissections and preparations under the microscope, consisting of parts of the mouth, antennæ, eyes, &c.

August 9th.—Mr. Stephen Barton, President, in the chair. Mr. F.V. Jacques exhibited a curious variety of Lamia textor, Lin., in which the basal joint of the left antenna was bifid, and had evidently borne two antennæ upon it, one having been broken off.

Mr. A. E. Hudd exhibited some remarkable varieties of Satyrus hyperanthus, Lin., which were deficient in the normal white rings upon the under side of the fore wings.

The President exhibited many undescribed species of Australian Geodephaga; among them were the genera Clivina, Dicrochile, Staropus, &c.

The Secretary exhibited the new Eupathecia lariciata, and two species of Corixa from Scotland, apparently new.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the "BRISTOL DAILY POST" *of Oct.* 12*th*, 1864.

On Thursday evening last, October 6th, this society held its first meeting of the session at the Philosophical Institution. Fifty-four members and friends, including several ladies, were present, Mr. William Sanders, president, occupying the chair. The usual routine business occupied rather more time than usual, the hon. secretary having to give a short account of the last annual meeting and the three summer excursions of the society, as well as some extracts from the minutes of the council. These latter were of too important a character to allow them to be dismissed by simply mentioning the transaction of this formal business; for they not only showed the continued steady growth of the society, but also gave clear evidence of the healthy and vigorous spirit animating this youthful body. Since the last monthly meeting of the society the following gentlemen had been elected members:—Messrs. George F. Atchley, John Bates, John Beattie, William Fiddes, junr., Edward R. Hodges, E. C. Plant, Septimus Powell, John Robert Rogers, W. H. Smith, William Tanner, senr., C. W. Warren, and P. J. Worsley. Also two more corresponding members had been added to the list, viz., Mr. Hugh Owen, late of Bristol, and Mr. G. N. K. Thwaites, of the Royal Botanic Gardens, Ceylon, too well known to require commendation. The other part of the abstract of the council meetings to which we have referred was the announcement of the formation of four sections of the society for a more severe pursuit of the various sciences, viz., an entomological section, meeting on the second Tuesday of every month; a botanical section, meeting on the third Friday of every month, from October to March inclusive, substituting botanical walks during the other half of the year; a geological section, meeting on the fourth Friday of every month, from October to March inclusive, also substituting walks during the summer months; and a chemical and photographic section, meeting on the second Wednesday of every month.

The hon. secretary having made these various communications, Mr. Thomas Pease, one of the vice-presidents of the society, exhibited two living specimens of Lacerta viridis, the common green lizard of Europe, which he had brought from the forest of Fontainebleau, where these elegant, active little creatures are pretty common, and made some remarks as to their habits and distribution, stating that they are not met with nearer home than in the Channel Islands.

The hon. secretary, Mr. Leipner, then read a note which he had received that day from Mr. Thomas Coomber, on the well and conduit waters in this neighbourhood. The writer has from time to time taken opportunities to examine these waters for the amount of organic matter which they contain. He had not intended to publish his results, until he had made some additions to them; but considering the present necessity to resort to these sources of supply, he felt it to be desirable to make them known to the society. The following are the heads of Mr. Coomber's remarks:—First—The cause of the unwholesomeness of the water is generally the presence of an excess of organic matter. Second—Different observers have regarded different amounts of organic matter as being the maximum which would allow a water to be used for domestic purposes without objectionable consequences. Third—The writer adopts as low a standard of purity as any. His determinations were made with a solution of permanganate of potassium, standardised by pure oxalic

acid. The results are expressed in terms of grains of oxalic acid per gallon. For example: the water of Peter-street pump is returned as containing .306 grains of organic matter per gallon. This means that the organic matter in a gallon of that water requires as much oxygen for its combustion as .306 grains of oxalic acid. All waters must be regarded as unfit for domestic use which contain more organic matter in the gallon than is equivalent to .5 grains of oxalic acid. Fourth—The following is the list of waters examined, with the results of their examination *in grains per gallon*, and the date on which the sample was taken:—

		Organic Matter.	Mineral Matter.
1863.	July 31st, Peter-street Pump	.306	116.4
	Aug. 4th, Wine-street P.	.192	98.7
	,, 7th, All Saints' Conduit	.171	72.6
	,, 7th, Market P.	.443	91.0
	,, 14th, St. Thomas P.	.170	84.0
	,, 17th, Temple C.	.210	33.6
	,, 19th,* Jacob's Wells, W.	.757	

		Organic Matter.
1864.	June 1st, Jones's-court, Frogmore-street, P.	.263
	,, 1st, Pithay P.	.163
	,, 2nd,* The Paddock, Easton-road, P.	.736
	,, 2nd, Bedminster-down P.	.430
	,, 2nd, Nelson-court, Bridewell-street, P.	.350
	,, 3rd, Kent's-buildings, Frogmore-st., P.	.121
	,, 4th,* Vine-row, Old-park, P.	.648
	,, 4th, Albert-place, Horfield, P.	.121
	,, 6th, Colston's Almshouse, St. Michael's, P.	.158
	,, 6th, Almshouse, top of Christmas-steps, P.	.127
	,, 6th, Albion-chambers, P.	.418
	,, 7th, Princess Amelia-court, P.	.220
	,, 8th, Boar's Head yard, Limekiln-lane, P.	.148
	,, 8th, Madox-court, Frogmore-street, P.	.224
	,, 9th, Pipe-lane P.	.274
	,, 10th,* Victoria-place, Bedminster, P.	.610
	,, 10th, Union-place, Cathay, P.	.176
	,, 10th,* Hill-street, Narrow-weir, P.	1.125
	,, 11th, King's-parade, White Ladies', P.	.279
	,, 11th, Gloucester-terrace, St. Michael's, P.	.167
	,, 13th, Edward-street, St. Philip's, P.	.188
	,, 13th, Meridian-vale, Clifton, P.	.128
	,, 14th, Armoury-square, Stapleton-road, P.	.285
	,, 14th, Berkeley-court, Berkeley-place, P.	.138
	,, 14th, Michael's-buildings, Paul-street, P.	.180
	,, 15th,* Red Lodge, Park-row, P.	.742
	,, 15th, Bedford-place, Terrell-street, P.	.273
	,, 16th, Frost's garden, Newfoundland-st., P.	.248
	,, 16th, Nelson's-place, St. Philip's, P.	.165
	,, 17th, Lower Belle Vue, Clifton, P.	.243

Fifth—The water, which the examination has proved to be unwholesome, is marked with an asterisk. Sixth—The amount of mineral matter has been determined in the case of the first six on the list. In the case of the first five this amount must be regarded as objectionably large. Seventh—The water of the Bristol Company was examined in the spring of 1863 and found to contain thirteen grains of mineral matter and one-tenth of a grain of organic matter per gallon, which proves it to be an exceedingly pure and good water.

The Hon. Secretary having made this communication, the Hon. Treasurer, Mr. Stoddart, exhibited some large masses of the metal magnesium and wire made of this metal, explained the method by which it is manufactured from sea water, briefly mentioned its properties, and showed the intense light produced by the burning of the magnesium wire.

The President then called upon Mr. Charles Ottley Groom, who read a continuation of his paper on the nidification of British birds, which he copiously illustrated with examples of their nests and eggs, some of which were handed round for inspection. He confined himself to describing the breeding habits of those which breed in Britain, and adverted to those of most of the warblers, accentors, buntings, finches, chats, larks, pippits, tits, wagtails, climbers, swallows, and doves. Mr. Groom said that eggs, by their colour and markings, often assist the classification of genera and species. He described the breeding of Savi's warbler, *Sylvia luscinoides*,

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and of the golden crested wren, and exhibited an exquisite nest of this last-named bird, over the entrance to which a turkey feather was placed by the bird as a valve or trap-door. The long-tailed tit's beautiful nest was exhibited. The nests of this species are sometimes lined with as many as 2000 feathers, all carried separately by the little bird. The chough breeds in April or end of March, laying five eggs; the nest is formed of seaweed or other refuse gathered from the beach, and is placed usually on cliffs facing the sea. The great black woodpecker, *Picus martius*, bred in the New Forest the year before last; it was never known before to breed in Britain. Several nests and eggs of the green woodpecker laid on the chips found in hollow trees were exhibited. The eggs are naturally pure white and shining, but are sometimes richly stained yellow with the rotten wood of the nest, of which examples were shown. The nuthatch's ingenious nest was also shown, made of the bark of the Oriental plane, artfully scooped off by the bird and carried into a hollow elm tree. The strips of bark appeared like shavings, done by the hand of man. Mr. Groom said he had never known a well-authenticated instance of the cuckoo, *Cuculus canorus*, making a nest for itself; it has been ascertained that here and on the continent it selects as many as 60 different species of nests to deposit its eggs, those of the red-backed shrike, golden oriole, fieldfare, red-wing, nearly all the warblers, larks and pippits. It has been known to lay its egg on the ground and convey it in its mouth to the nest, and has been caught sitting on the nest to lay its egg. It usually lays one egg in one nest; two eggs of the cuckoo have, however, been found in one nest, probably laid by two cuckoos. The old cuckoo has been seen to feed the young one, but the foster mother has more frequently been seen to feed the little bird, whose peculiar form enables it to shovel out the other young or eggs, and thus become the sole ruler of the nest. The colour of the eggs of the cuckoo varies remarkably, and approximates to the colour of the eggs of the species it selects. If this be a tree pippit, the cuckoo's egg assumes a brownish tinge; if a reed warbler, a greenish cast, &c., which was shown to be the case in many examples exhibited by Mr. Groom. This colorisation theory supposes that an impression is made on the sensorium of the bird by the view of the tint of the eggs in the foster parent's nest, which causes it to lay an egg of somewhat similar colour. Still the egg is always sufficiently marked to be recognised as the cuckoo's. This is a new application of a popular belief, current in all ages, on which Jacob acted in his dealings with Laban's cattle. The kingfisher, *Alcedo ispida*, excavates its hole along the sandbanks of our rivers, and lays its seven eggs on the bare earth, or on a collection of fish-bones, vomited by the bird, the refuse of fish swallowed by it. The eggs are of an exquisite pink before being blown, from the yolk shining through the semi-transparent shell; its nest and eggs are complete about the middle of April, and the hole always rises upwards from the water, forming a steep drain for any moisture to run away. Mr. Groom exhibited a nest of fish-bones and eggs of this species, and concluded by describing an ornithologist's ramble in Sussex, and the various situations of nests and eggs of many species.

The usual time of closing the meeting having drawn near, and Mr. T. Graham Ponton kindly consenting to defer his paper "On the Land and Freshwater Mollusca of the Bristol District" to the next meeting of the society, the remaining portion of the time was spent in eliciting from Mr. Groom some observations on the colouring matter of the eggs of birds, and on the occurrence of two birds of the same species, or two birds of even different species, laying their eggs in one nest.

After spending some time in the examination of Mr. Groom's specimens on the table, the meeting separated.

ADOLPH LEIPNER,

Honorary Secretary.

BRISTOL NATURALISTS SOCIETY.

SECTIONAL MEETINGS.

From the "BRISTOL DAILY POST" *of Oct. 27th*, 1864.

BOTANICAL SECTION, SEPT. 29TH.—The members of this section, with their president, Mr. Leipner, met at Cumberland-basin on Thursday, September 29th, for the last botanical walk of the season. They proceeded by means of the Fairy Queen as far as Pill, when, having landed and passed through the village, they at once entered the romantic and fertile valley called Markham Bottom, which is copiously watered by the small stream running through it. The richness of the soil and the abundance of water had a striking effect upon the growth of the vegetation as compared with that of the higher grounds this summer. The common brake fern, so plentiful yet stunted on our Downs, here attained, in one instance, a height of above seven feet, and other plants of this order were also remarkable for the size of their fronds; among the species being polypodium vulgare, polystichum lobatum, lastrea filix-mas (five feet high), L. spinulosa, scolopendrium vulgare, asplenium trichomanes, and on the wall of the bridge at Markham A. ruta-muraria. Some of the umbelliferœ were also very fine; a specimen of angelica sylvestris measured six feet, and among others were noticed sium augustifolium and heracleum sphondylium. In the brook was a quantity of helosciadium nodiflorum, and its frequent companion nasturtium officinale, and on its banks were the broad, handsome leaves of arctium lappa. Pendent from the branches were the beautiful garlands of humulus lupulus overhanging the sweet-scented regal spirœa. Dipsacus pilosus in fruit was also found in considerable quantity, and among other plants peculiar to such localities were senecio aquaticus, stellaria glauca, cerastium aquaticum, acinos vulgaris, eupatorium cannabinum, and mentha aquatica. Several lichens and fungi were found in the valley, and on the bridge before mentioned some species of bryum, tortula, &c. On arriving at this point the party ascended to the Portbury-road, finding on the hedge bank sison amomum, hypericum perforatum, and daucus carota; corylus avellana, the nuts of which may be had in abundance, was seen flowering a second time, a proof of the extraordinary character of the season. The members then returned through Leigh to Bristol.

GEOLOGICAL SECTION, SEPT. 30.—*Inaugural Meeting.*—The rules of the section were made and officers selected. President, Mr. William Sanders, F.R.S.; secretary, Mr. Frederick Ashmead. To meet on the evening of the fourth Friday in each month, from October to March inclusive, and for geological walks during the remainder of the year. A discussion took place on the coal measures of Bristol and Kingswood, the upper and lower measures being separated in some parts by a band of true pennant, and in others by pennant undistinguishable, lithologically, from millstone grit. The working out of the lias beds, starting from the so-called Sunbed at Saltford, was mentioned as appropriate practical work for the section.

CHEMICAL PHOTOGRAPHIC SECTION, SEPT. 27.—*Inaugural Meeting.*—The sectional rules were made, and Dr. W. B. Herapath, F.R.S., elected president, and Mr. Alfred Noble secretary. To meet on the second Wednesday in each month, for the consideration of papers in each branch.—*October* 12.—Dr. Herapath addressed the section, and regretted that his time had been so much taken up in preparing four

extensive papers for the British Association, that he had not been able to prepare a paper of interest, but as president of the section he would make a few introductory remarks upon "Solar power, radiations and emanations." Sir Isaac Newton had demonstrated that by refraction he could produce from white light a prismatic spectrum, composed of seven primary colours of different refrangibilities, and that these seven primary colours could be re-combined to produce white light. Sir David Brewster had shown that these rays were capable of absorption by different substances, and assumed that only three primary mono-chromatic colours existed. When any substance was looked at by a pure yellow mono-chromatic light, all the coloured rays but the yellow being absent, only the yellow ray could be reflected; so that all bodies were then either decidedly yellow or black, whatever their colour may appear to be in ordinary white light. On the contrary, when seen by red light, the red only was reflected, and when seen by blue light, the blue was reflected, all other rays being absent; other coloured objects would appear black of various depths of shade. So that he considered the solar spectrum to consist of three spectra—the red, yellow, and blue placed one over the other, and he thought that these were the only primary colours. This idea of the constitution of the solar spectrum has lately received some severe blows. The new metal thallium gives a beautiful mono-chromatic green light, which cannot be split or analysed by refraction or absorption, and we must therefore admit the colour of the flame of thallium to be a primary or mono-chromatic colour equally with the sodium yellow. The researches of Herschel and Stokes prove the spectrum to be still more complicated. Stokes showed that there is beyond the extreme violet ray an invisible spectrum, containing as many rays and dark bands as the ordinary visible spectrum, and which could be made visible by the changes produced on papers prepared with quinine, quinidin, turmerie, or esculine, &c., on which the solar spectrum was thrown. These facts lead us to extend our notion of prismatic analysis, and to consider that there are at least seven primary colours or probably more. Heat and chemical agency also accompany the rays of light and constitute part of the solar radiations. These different rays can be separated by passing through various substances. Thus solutions of quinine or quinidin will arrest and reflect the extreme or ultra-violet rays of light, and render visible the florescent rays, giving a beautiful blue colour. A plate of alum or ice, one tenth of an inch thick, will absorb all the rays of heat; a plate of yellow glass will absorb and arrest all chemical power, whilst a plate of blue glass will cut off the maximum amount of illuminating power, but will transmit the actinic, chemical, or photographic rays, so that the solar spectrum consists of three agencies--light, heat, and chemical power. Solar heat is the cause of the magnetism of the earth, by producing electrical phenomena or currents in the atmosphere at right angles to the poles. We may also say that the population of the earth is due to solar agency, through the ultimate conversion of coal into man. Many believe that all men have sprung from one common ancestor, but according to other authorities the human race has arisen from five widely separated centres. Each adult human being contains 21 lb. weight of carbon in his body. There are now more than 1000 millions of inhabitants in the various nations of the world. Whence comes all the carbon contained in the bodies of the human race? It is not handed down from father to son. The infant of scarcely nine pounds' weight represents about $1\frac{1}{4}$ lb. of carbon. There are at the present day more than $9\frac{1}{2}$ millions of tons of carbon invested in the bodies of the human race. Now, coal burnt in our factories or on the household hearth becomes carbonic acid; this carbonic acid is decomposed by vegetables, the carbon being absorbed through the agency of light and solar heat; the vegetables become the food of animals, and animals and vegetables are the food of man—so that we may

say that the past and present enormous consumption of coal eventually produces man, and accounts for the increase of carbon in the human race. These changes are mainly occasioned by the sun's agency, for without sunlight, solar heat, and solar chemical power no plant could grow and no carbonic acid could be decomposed. Solar light is thus the source of all man's power and thought and motion, but we must not look upon it as the first primary cause, for the Great Architect of the universe promulgated the laws which have governed the action of light, heat, and chemical agency of the solar power ever since the creation of the world.

The Rev. W. Whiting, M.A., then made a verbal communication on the subject of transparent slides for magic lanterns for educational purposes. He had given this subject much attention, his endeavour having been to popularise science by exhibiting in the magic lantern transparent photographs of microscopic objects. The Government had shown their appreciation of the benefits derived from the exhibition of good subjects in the magic lanterns by ordering a complete set of the apparatus and slides to be sent to the depôts of all regiments. Various papers have been published at different times on micro-photography, making difficulties and discouraging persons from taking the subject in hand. Mr. Whiting said he had found no difficulty, whereas many had put the expense of necessary apparatus at from £25 to £40. His apparatus cost less than £4, and produced results he had brought with him to show. He exhibited a large French camera which, he said, was not worth 2s. 6d., and a Field's microscope, sold complete for £3 10s. This was the whole of the apparatus he used. He found Field's microscope better than many more expensive ones by the best makers, as the chemical and visual foci of the lenses were coincident. Mr. Whiting mentioned several ingenious contrivances which are likely to be serviceable to photographers. Instead of a ground glass for focussing, he used glass on which a film of collodion containing four grains of rosin per ounce had been spread. Mr. Whiting exhibited a choice selection of photographs of microscopic objects, and promised on a future occasion to go further into the subject of micro-photography. Before concluding he said that he quite considered that photography should be in subserviency to chemistry, and that it was one of the objects of the section that photographers should state their difficulties for chemists to remove them. In that hope he mentioned a paper published by M. Poitevin, stating that the vapour of benzine appeared to sensitise in some measure plates covered with insensitive iodide of silver. He simply brought this subject forward, hoping some one might take it up, and remarked what a boon it would be if photographers could sensitise dry plates by simply exposing them to a vapour.

T. H. YABBICOM,
F. ASHMEAD,
A. NOBLE, } *Sectional Secretaries.*

WM. LANT CARPENTER,
Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the "BRISTOL DAILY POST" *of Nov. 7th*, 1864.

The thirty-first meeting of this society was held on Thursday evening last at the Philosophical Institution, and was attended by upwards of seventy members and friends, including several ladies. Mr. W. Sanders, F.R.S., presided. Mr. Leipner, the honorary secretary, announced his readiness to receive names for the formation of a zoological section, in accordance with the wishes of several members. Mr. W. W. Stoddart exhibited a small specimen of a fresh water Entomostracon, called Cheirocephalus diaphanus, which resembled a minute shrimp, stating that he was in want of more specimens for experiment, and would be much obliged to any member who could furnish him with some. Mr. C. O. Groome exhibited a salmon-coloured mole, taken near the foot of Mount Pilatus, in Switzerland, which was said to become gray in summer, and which he considered to be a specimen of a race, and not an albino. Mr. Leipner mentioned having seen a cream-coloured mole taken in Tyndall's-park in September, 1863, and a piebald or spotted specimen last month in Redland.

Mr. T. GRAHAM PONTON then read a paper on "The Land and Freshwater Mollusca of the Bristol district." He stated that he wished to show what had already been done in the subject, and, by indicating what remained to be done, to enlist the co-operation of more workers. The total number of genera of British land and freshwater Mollusca being 34, comprising 110 species, it appeared that 31 genera, including 80 species, occurred locally. The author exhibited specimens of these, described many in detail, and indicated their usual *habitats*. We may notice a few of the more generally interesting tribes. In speaking of the Helices, or snails, the author made some interesting observations on the employment of snails as an article of food. Among the Romans, they were considered a great delicacy, and in many countries they were still eaten, even by the higher classes; while the annual snail dinner of the Glassmen at Newcastle proved that they were once esteemed as a dainty even in Britain. Mr. Ponton also referred to the acuteness of the sense of smell in these animals, and remarked that though the position of the olfactory organ was still a mystery, there was no doubt of its existence; and after suggesting that the inferior pair of tentacles might serve the double purpose of general sensation and smelling, he expressed a wish that the members would direct their attention to the discovery of its true situation. Of eight British species of Limax, or the slug, only two were local. The great devastation caused by the gray slug, L. agrestis, was easily accounted for, when it was considered that a single individual produced 1100 others in two years. The second species, a little black slug, was much used in soup, &c., for pulmonary complaints. Of the Planorbis, all the British species were local, and, with one exception, common.

In a short discussion which ensued, an unsuccessful attempt was made to find the locality of Helix Poniacea, reputed a Bristol shell; and Mr. Leipner pointed out how many more species Mr. Ponton had indicated as occurring locally than were indicated in a paper recently read at the British Association at Bath, which paper, however, like many others, was most unintelligibly reported in the published volume of reports.

Dr. HENRY FRIPP then read a very elaborate paper, entitled "Notes on the Glow-worm." After referring to the still unexplained mystery which surrounded the wonderful phenomena of the emission of light by many of the lowest forms of animal life, the great interest which it excited both in the popular and the scientific mind, and the treasure of illustration and metaphor which the luminous insects had

been to poets and writers of every class, the author set forth as the object of his paper, firstly, to give a brief account of the natural history of the glow-worm, gathered from various sources, as well as from his own observation; secondly, to mention the opinion of different authors concerning the nature and source of the so-called phosphorescent light; and lastly, to record a few observations which he had himself made or verified after others on the anatomical structure of the glow-worm, and of such chemical and physiological experiments as appeared to offer a rational explanation of the striking phenomenon of insect illumination. It is to this last division of Dr. Fripp's paper that the greater portion of our report will be devoted.—I. The light-emitting insects of Europe form three families, Lampyris, Phosphænio, Luciola. The glow-worm belongs to the first. Lampyris noctiluca is the species abundant in England, Belgium, and the North of France; but there are several others, especially in America. The main characteristic feature of the family is the expansion of the prothorax over the head, which is quite concealed, and invaginated within the buccal integument as in a pouch—an oblong oval flattened body, covered with a soft chitin skin; the male small and winged, displaying four small luminous points, two on each of the two last segments. The females lay eggs at the end of July, the larvæ are hatched in a few weeks, and, living through the winter, develop into adults in the spring, as a predaceous insect, existing on minute mollusca. In June they assume the nymph state for a week; the female form preserves that of the larva, being apterous, and when mature becomes entirely herbivorous, this change being accompanied by a corresponding variation in the structure of the alimentary, muscular, and nervous systems.—II. The author then read a long description, by Professor Kolliker, of the anatomy and physiology of the illuminating organs, showing that they had all essentially the same structure, consisting of a capsule, parenchyme of cells, tracheæ (or air passages), and nerves; that the shining was dependent on the volition of the insect; that the duration of irritability of the organs is, under favourable circumstances, considerable; and that he (Professor Kolliker) concluded that the illuminating organs were a nerve apparatus, and found their nearest analogy in the electrical organs of other animals. Observations by Matteucci and Roberts were then described, who considered the phosphorescence as resembling the phenomenon of combustion, though no sensible heat was evolved; by Schnetyla, who believed that it was actually due to phosphorous; by Thornton Herapath, who, unable to detect phosphorus, thought the light due to a compound of carbon and hydrogen secreted in a special gland; by Carus, by Macartney, and by Dr. Phipson, who considered that the luminosity could be directly traced to the instinct of the insect, through the correlative forces, electricity and nervous force; and Dr. Fripp then read an extract from Dr. Carpenter's Physiology to show that these instinctive manifestations partook more of the nature of the so-called reflex actions dependent upon external stimuli than of really voluntary movements.—III. The author then proceeded to describe more in detail his own observations and opinions. He first of all enlarged upon the great difference between the male and female Lampyris in the alimentary canal, the male possessing a very strong gizzard, and stomach with rough muscular coats, with a long intestine folded on itself, besides a large mass of glands and gland cells at the point of junction of the two; while the female had no gizzard, a smooth stomach, straight intestine, fewer glands, and a large oviduct. His special attention, however, had been given to the investigation of the light organ, and of the peculiar greasy substance surrounding it, noticed under various names by several observers. In the larva, the light organ appeared as a capsula inclosing cells with indistinct nuclei, just like a granule or simple nerve cell. A further development showed an aggregation of small cells,

with threads and fine nerves running between them, the whole showing much organised structure, and when torn asunder slightly, the fatty bodies appeared to be connected in strings of beads, by stalks, consisting of a tube and the contents of the granules, without a central axis. In the female, these bodies appeared more spherical, and closely aggregated in large continuous masses, filling the whole cavity of the body not occupied by the ovaries and alimentary organs. The adult organ in the female was composed of rounded polygonal cells, lying close together in a thick mass with ramifications of tracheæ running between them, and a fine stroma of nerve fibrils, on which the nuclei and granules lay. The nervous system was very large, showing an extraordinary individualisation of nerve power. This fatty substance had not, as far as the author knew, been shown before to have so much structure; it was not the direct source of light, for the luminons points were a mass of nerves, but it was in some way connected with it, and he attributed the presence of uric acid and urate of ammonia, crystals of which were often observed in the substance, to its own decomposition. On the whole, he was disposed to regard the light as a result of nerve force acting through a peculiar instrument made for the purpose, this fatty matter making up as it were, by its own disintegration, for the waste of nervous force, while the products of this disintegration were oxidized and then removed, in which sense only could combustion be said to have anything to do with the light.

Owing to the lateness of the hour the discussion on this important paper was adjourned, and the remainder of the evening spent in the examination of the beautiful microscopic preparations provided by Dr. Fripp.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

SECTIONAL MEETINGS.

From the "BRISTOL DAILY POST" *of Nov.* 21*st*, 1864.

GEOLOGICAL SECTION, OCT. 28TH. — Mr. W. Sanders, president, in the chair. Mr. J. Keal continued the discussion of the last meeting respecting the Lias beds of the neighbourhood, and gave an interesting account of his endeavours to discover the point of junction of the New Red Sandstone and the Lias, describing minutely the beds and fossils on Bedminster Down, the most noticeable of which were Terebratula psilonoti, at Colliker's brook, an evidence of Lower Lias, and Ammonites planorbis at Yanley-lane. Mr. Keal went at great length into the question at issue between Mr. C. Moore, of Bath, and Dr. Wright, of Cheltenham, and concluded by proposing as a problem for solution the range of the Saurians in the Bristol district, and their relation here to the Ammonites planorbis, which he was satisfied occurred above the white Lias. Mr. Sanders confirmed the last remark, and said that he did not consider the Saurians to be confined to any one zone; he pointed out the desirability of making a great number of accurate sections to scale of all the lias beds, and correlating them, taking the Cotham, or Landscape marble, as a good landmark from which to reckon vertical distances of beds, which should all be numbered, and notice taken of the fossils occurring in them. The Saltford section might be used as a model. Mr. W. W. Stoddart exhibited a large collection of fossil Entomostraca, or water fleas, which he had obtained from all formations, Silurian to Postpliocene. In the living state they were all aquatic, with two valves, and a chitinous shell, moulted yearly, which was the cause of the great abundance of their remains. With the exception of the well-known Trilobites, which he believed to belong to this class, they were all microscopic, and were obtained from the beds they occurred in, by disintegrating the stone by mere heat, or heat and cold water, passing the powdered mass through sieves of various fineness, and picking out the minute fossils under a microscope.

ENTOMOLOGICAL SECTION, Nov. 8th, Mr. Jacques in the chair. Mr. G. Harding exhibited Acronycta Alni. L., Lucania Elymi Gn., Crambus falsellus, taken at Stapleton, and Diasemia literalis Scop., only two specimens of which have been taken in this district. Mr. John Barber stated that ivy-beating had not been as profitable as usual this year, but exhibited the following: Orthosea lota and macilenta, Xanthia ferruginea, Auchocetis rufina, pistacina, and lituria, Polia flavocincta, several varieties of niselia Oxyacanthae, Xylina rhizolitha, semibrunnea, and petrific ata. Mr. Reed stated that the two last species were peculiar to the South-West of England, and were much more rare than they were six years ago. Mr. A. E. Hudd exhibited a curious variety of Agrotis corticea W.V., Crambus furcatellus, Zett., Eupithecia denotata, Hub. and E. dodoneata Gn., with Pteroxia candella L. The hon. secretary, Mr. E. C. Reed, exhibited several hundred specimens of Coleoptera and Hemiptera, collected during the preceding month in the Bristol district, including Diphyllus lunatus Fab., Dictyopterus minutus Fab., Carpophilus hemipterus, Philonthus splendens Fab., P. intermedius Lac. and P. laminatus Cr. Mr. Reed also explained and practically demonstrated the manner of preparing parts of insects for microscopical examination, the determination of specific differences often requiring the dissection of parts of the mouth, in which magnifying power was almost always a great assistance.

Chemical and Photographic Section, Nov. 9th.—Dr. W. B. Herapath F.R.S., in the chair. The attendance was very limited, and it was agreed to make the hour of meeting eight o'clock. Mr. W. L. Carpenter made a communication on some Analyses of Silicates of Soda. The author referred to the want of definiteness in the compounds of silicic acid with soda, and the impossibility of isolating them, as they had no tendency to crystallise. He mentioned one which he believed to be definite, as he had obtained it by two entirely different processes, and adduced the results of many analyses to show that the greater the proportion of the acid to the base in these salts the more water was necessary to make a solution which would not be decomposed by further concentration. Mr. P. J. Worsley then read a paper on the Conditions of Sensibility of Iodide of Silver. He said that this substance, the one of all others most sensitive to light, might be presented to its action under two conditions, as nearly pure as possible, or in conjunction with other substances. In the first case, colour and temperature had very little influence, but molecular arrangement more so, and unfortunately these physical differences were the least understood. It was exceedingly difficult to prepare a pure iodide of silver, even by the direct union of its constituents, but a long series of experiments led to the conclusion that the salt, if absolutely pure, was insensitive. It certainly was not decomposed by light, but it was necessary to distinguish between decomposition and mere molecular alteration, unaccompanied by chemical change. Iod. silver occurred in practice in two states, a bright yellow, very sensitive, and a pale yellow, insensitive, or nearly so, to the action of light. When used in conjunction with other bodies, its sensibility might be diminished, unaltered, or increased. Strong acids, iod. potassium, and anything that hindered the reducing action, diminished its sensibility. Of bodies that had no action, the author instanced pure water, neutral salts of the alkalies, collodion, &c. The most important bodies, however, were those which increased the sensibility, and they varied greatly in chemical composition and mode of action. Foremost among them were the oxygen salts of silver, also the chloride and bromide of silver—then tannin, gelatine, gum, sugar, benzol, turpentine vapour, and many others. Nearly the whole of these could be shown to be themselves decomposable by light, air being present also, and the author stated that, as far as his experience went, there was no case in which iod. silver was sensitive, unless some other substance was present which was also reducible by light. Might not the function of the iod. silver be, therefore, he said, more mechanical than chemical, this salt acting as a kind of filter to separate the chemical rays, and concentrate them upon the other substance, which was thus more affected by light than it would be alone?

Botanical Section, Oct. 21st.—First evening meeting, Mr. Leipner, president, in the chair. It was resolved that the meetings for the future should be held on Thursdays, instead of Fridays; also that a Herbarium, which should be open to any member of the Parent Society, should be established by the joint efforts of the members of this section. Mr. Yabbicom proposed a resolution, urging on the Council of the Society the desirability of forming a library of standard scientific works, especially those whose price placed them beyond the reach of individual expenditure. The chair having been taken by Mr. Derham, Mr. Leipner read a paper on the preparation of some of the lower orders of the vegetable kingdom for microscopic observation. Confining his remarks chiefly to the tribe Diatomaceæ, the author stated that the neighbourhood of Bristol contained a great number of species, and that they were to be found in abundance in almost every part of the Floating-harbour, either attached to other objects—as grass, wood, or filaments of algæ—or perfectly free. In the latter condition, Pleurosigna hippocampus and Nitryschia tania might be seen on a bright day in greenish yellow masses on the mud outside Cumberland-

basin. The diatoms having been obtained fresh, might be mounted in fluid to exhibit the valves and endochrome, as also their mode of growth; but to exhibit the surface markings it was necessary to destroy the vegetable contents, either rapidly by charring between two plates of glass over a lamp, or better by boiling with nitric acid and washing in distilled water, when nothing was left but the siliceous valves, which were most suitably mounted in Canada balsam. Practical demonstrations were given of the mode of proceeding, and Mr. Leipner promised on a future occasion to explain the method of mounting the Desmidiæ.

Botanical Section, Nov. 17th, Mr. Leipner, president, in the chair. Arrangements were made for future microscopic working meetings, when practical instruction in the use of the microscope in its application to botanical investigations would be given. Mr. Yabbicom exhibited a specimen of Lonicera Xylosteum, found on St. Vincent's Rocks last July. He stated that it was an exceedingly rare plant, having been hitherto found only in three other places in England—Northumberland, Sussex, and Warwickshire. It belonged to the natural order Caprifoliacæ, the plants of which were found in the northern parts of Europe, Asia, and America, and the specimen shown possessed most of the characters of the order, but differed from the common Periclymenum by the flowers growing in pairs instead of whorls, by having less beauty of color, and none of the fragrance which the honeysuckle possessed. Many plants of this order had valuable properties, but this example had none, its great rarity being the source of interest.

Mr. S. Barton produced the flower and leaf of a species of the genus Banksia, or swamp honeysuckle. All the species were Australian, and generally shrub-like plants, but this species had been seen twenty feet high, with pale yellow flowers, in dense lateral clusters, and scanty foliage. The timber was too brittle for use, but it was suggested in the discussion that this defect might be modified by the proper use of soil in cultivation.

The remainder of the evening was spent in examining such mosses as could be found in fruit, as Hypnum, Bryum cæspiticum, Tortula muralis, and Funaria hygrometrica. The president stated that several good stations for mosses in the district had not yet been well worked, and that there were several genera as yet incomplete, as Phascum, Gymnostromum, and Orthotrichum, and also that several very common mosses had not yet been found in fructification.

F. ASHMEAD,
E. C. REED,
A. NOBLE,
T. H. YABBICOM, } *Sectional Secretaries.*

WM. LANT CARPENTER,
Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the "BRISTOL DAILY POST," *of Dec. 7th*, 1864.

The thirty-second ordinary monthly meeting was held at the Philosophical Institution last Thursday evening, when Mr. W. Sanders, F.R.S., presided over a large number of members and friends, including several ladies. The hon. secretary, Mr. A. Leipner, announced the election by the council of eight new ordinary members, and brought forward a resolution of the council with respect to the formation of a scientific library, which it was proposed to establish by the aid of voluntary subscriptions from members, as the general funds of the society were insufficient for the purpose, and it was considered undesirable to increase the annual subscription. Some other formal business was transacted, after which,

Mr. DAVID DAVIS read a paper on the Natural History of the Inhabitants of the British Islands. He commenced by laying down certain principles or axioms, which were the results of observations, and which guided him in his studies, but which he would not stop to prove, the chief of which were, that climate had no influence in permanently altering the varieties of man; that there was such a tendency in types to recur, that a type was never lost by admixture with others so as to form a new one; that the offspring of distantly-related types were always mulattoes, while that of types nearly related resembled either the father or mother; and lastly, that physical variations were accompanied by corresponding mental and moral peculiarities. Referring to Macaulay's New Zealander, Mr. Davis said that the first question he would probably ask would be, whence arose the greatness of the British nation, as yet unexampled in the world's history—what kind of people they were, the remains of whose works he was contemplating? The answer would probably be, that the people were the result of a combination of races; and the author contrasted the French, in which nation there were only two races, with the English, in which there were six or seven. These he proceeded to describe in detail, physically and morally, illustrating his remarks with diagrams and photographs. Of the aboriginal race no remains were found except two skulls, one of the kumbucephalic type---and a later one, brachycephalic in form. The next race was the Basque, or Iberian, once spread over the whole of Europe, but of which remnants only were found in Spain and among the Lapps, though the author believed that some were to be found in the west of Ireland and also in South Wales, but there the race was overlaid by the Cimbric. The third race was the Celtic, the origin of which it was impossible to trace, records of them occurring upon Egyptian monuments 13 centuries before Christ. The Celts were at one time spread over the whole of Britain, and the oldest names in Wales were Celtic, not Cimbric. After giving the physical characteristics as detailed by a French ethnologist, the author carried out his description to their mental and moral characters, saying that they were of nervous temperament, made the best soldiers, and took religion from their leaders. Their taste, when cultivated, was of a very high order, as well as their perception of wit. The highest oratory was confined to this race; also, that a firm paternal government was best suited for them. On the whole, it had contributed its fair quota to British greatness. The fourth race was one often confounded with the Celtic, from which it must be carefully distinguished—it was the Cimbrian. The members of it came originally from the shores of the Black Sea--the Crimea, and drove out the Celts in many parts of Europe. They conquered all England south of the Thames, and opposed the landing of Cæsar's legions, not professing to be aborigines. Physically, their strength and breadth of shoulder were very remarkable. Mixed with the lighter Cimbric race in Wales was a dark variety, possibly Basque, remarkable for a peculiar form of the upper eyelid.

They were essentially a theological and metaphysical race; bore trouble badly; not witty, but humorous; cautious, with but little general taste, and a courage allied to obstinacy; not externally demonstrative, and more suspicious and jealous than the Celts. They made the best sailors, and had a great natural taste for music. The fifth race described was the Saxon, distinct from the Anglo-Saxon, and often improperly taken as the John Bull, or type of an Englishman. Specimens of this race were to be met with in Berkshire and some parts of Gloucestershire and Hampshire, also occasionally in Bristol, which was essentially a Celtic city. The physical characteristics of these English farmers were too well known to need much description, and their mental peculiarities were especially a sound common sense, great perseverance, a love of order, and little desire for change, a genial nature, equanimity in bearing losses, and no taste for theology or metaphysics. The author then observed that, had England been left to these races alone, she would never have been great, as these races would not have combined and worked together, but rather quarrelled and destroyed each other; and it was to a race probably superior to all the preceding, namely, the Norse, or Scandinavian, that the binding together, as it were, of all these races, for one common object, was due. It was found more or less in Devonshire, and in Scotland and the North of England there was a substratum of Cimbric, overlaid by Norse. This race, with more than a mediocrity of talent in many points, and a deficiency in none, employed each of the other races in the way in which their special characteristics were most available--thus the Celts for soldiers, the Cimbri for sailors and work requiring great manual strength, &c. As a race, they were very firm and decided, possessing in theological views an union of the Welsh and Scotch; it was to them that the establishment of colonies was mainly due. Mr. Davis then said that there were undoubtedly a few other varieties of races, as some remnants of the Romans, to be found among pugilists, who were a mixture of Saxons and Romans and others. He concluded by expressing his opinion that there was no real inferiority or superiority of race, each having its own end to accomplish, and by acknowledging his obligations to Dr. Beddoe, whose opinion he frequently referred to in the course of the paper, and whose advice and assistance he at all times found most valuable.

A short discussion ensued, in the course of which Dr. Beddoe expressed his satisfaction that a Welshman had at last taken up the subject of ethnology systematically, Mr. Davis being, he believed, the first native of the principality who had done so. The Welsh race was incomprehensible to the inhabitants of England, and also unable to give a good account of itself; he considered Mr. Davis quite competent to follow up the ethnology of Wales. Tacitus, 1800 years ago, had noticed that the inhabitants of South Wales reminded him of Spaniards, and Dr. Beddoe considered that the present great physical resemblance went some way to prove the permanence of type. With respect to the question which was the theological race in Scotland, the speaker was disposed to consider the inhabitants of the Western Lowlands as such. There were records of the Cimbric race in that part of the country, of whose extirpation there was no evidence, and he had a personal knowledge of the existence of that type there.

Mr. T. Grundy exhibited a very large hedgehog, recently caught in the neighbourhood, and several remarks were made upon its habits by various members. Mr. Grundy also showed as a curiosity from Ventnor, Isle of Wight, an old knife, surrounded by pebbly conglomerate. The president observed that it was a good illustration of ferruginous infiltration, and an example occurring in the knowledge of man of a process which went on for long geological periods, and of which many other examples were given in Sir Charles Lyell's geological works.

The meeting adjourned on receiving the announcement that Mr. Handel Cossham's paper would be read at a future meeting, public engagements having prevented the author from fulfilling his promise that evening.

WM. LANT CARPENTER,

BRISTOL NATURALISTS SOCIETY.

SECTIONAL MEETINGS.

From the "BRISTOL DAILY POST," *of Dec.* 23rd, 1864.

GEOLOGICAL SECTION, Nov. 25th.—Mr. W. Sanders in the chair. It was resolved that the day of meeting be altered from the fourth Friday to the fourth Thursday in the month. An indiscriminate series of fossils from all rocks below the Devonian were placed upon the table for examination, and the president proposed that each evening should be devoted to the study of one special class of fossil, so that ultimately the members might become familiar with many, if not all, of the extinct remains, and therefore he, in conjunction with Mr. Stoddart, exhibited, as a commencement, examples of the oldest known forms of animal life, indicating their locality in this neighbourhood. Thus, at Tortworth all the characteristic Lower Silurian fossils, as found in Wales, might be obtained; and there also, as well as at a point between Longhope and Grange Court stations, on the South Wales railway, a large number, if not all, of the Upper Silurian corals were to be found. A slab of stone from the Wren's Nest, Dudley, was thus shown, containing a great number and variety of Wenlock limestone (Upper Silurian) fossils, among which we may name Cœnites labrosus, Alveolites repens, Atrypa reticulata, Retzia cuneata, R. deflexa, Fenestrella assimilis, and Rhynchonella borealis. After some discussion upon these, Mr. Stoddart exhibited a perfect specimen of Calymene Blumenbachii, found at Martley, Worcestershire; also Nummulina lævigata, and Alevolina Boscii, which he had obtained in the Eocene beds of Sussex, and lastly Fusulina cylindrica, from the Russian carboniferous limestone, sent by Professor T. R. Jones.

ENTOMOLOGICAL SECTION, DEC. 13TH. — Mr. Barton, president, in the chair. The hon. secretary, Mr. E. C. Reed, being about to leave this country for Australia, tendered his resignation, which was accepted. Mr. John Barber was elected for the remainder of the year. Mr. Reed then read a short paper on the Entomology of Australia. Very little was known of the Northern part, and only a rough estimate could be given of the Southern. The best collection in this country was that of Mr. Bakewell, and it was supposed that in his collection, that of the Adelaide Museum, and of Messrs. Waterhouse and Wilson, there were not less than 5000 species of Coleoptera. Upon the authority of Mr. Wilson, the following numbers of species in the principal families were given as approximative :—

Curculionidæ ...	600	Chrysomelidæ ...	450
Buprestidæ ...	300	Cerambycidæ ...	250
Carabidæ... ...	200	Melonothidæ ...	100
Helopidæ ...	100		

The smaller species were not neglected, a gentleman in Sydney having recently described Pselaphidæ. The other orders had not been so thoroughly investigated, but the following numbers of species and representative families were given :—

Hymenoptera ...	2500	Schneumonidæ. Apidæ
Lepidoptera ...	1500	Geomotræ. Pyralidæ
Diptera	1500	Muscidæ
Orthoptera... ...	200	Locustidæ
Hemptera and Heteroptera ...	500	
Neuroptera ...	100	

It is expected that in a few years these numbers will be doubled.

Mr. A. E. Hudd exhibited Eupithecea venosata, linariata, virgaureata, and subnotata.

CHEMICAL AND PHOTOGRAPHIC SECTION, DEC. 14.—In the absence of the president, Mr. Leipner took the chair. The secretary requested that all members would endeavour to prepare some short paper for the section. Mr. Leipner

stated that he was in want of some photographic illustrations of quarries and other points of geological interest for the forthcoming publication of the society, and he requested the assistance of the members of the section in taking negatives of localities to be pointed out, and in printing positives. Two members at once promised assistance. Mr. Alfred Noble read a paper on the "The Chemistry of the Sewage Question." After glancing at the importance of the subject, and naming the valuable constituents of sewage, the author stated that it might be regarded either in the purely sanitary, or in the utilitarian point of view. He then spoke of the system of water carriage, now so extensively adopted, and the plans at present in use for employing sewage, by irrigation, upon land, expressing his opinion that too much faith was put in that mode of working, and concluded by strongly advocating the use of dry earth as the best means both of disinfecting and removing in a small compass the valuable product in such a form that it could be at once applied to the land without inconvenience, a plan which had been developed by the Rev. Mr. Moule, of Dorchester. After some discussion, especially on the practical working of this new plan, which appeared satisfactory, Mr. John Beattie made a communication on the Wohlthytype, so much talked of lately, as producing photographic pictures that did not fade. He said he had seen pictures in London which were vigorous, delicate, and soft; but that the specifications of the process were very incomplete, and his relations with the company unsatisfactory, so that he had not been very successful in obtaining good prints. The uranium salt employed acted solely as a reducing agent, like gallic acid, and the picture was *in* the paper, and not on the surface, the collodion film acting as a glaze, so that he considered them quite as likely to fade and from the same cause as ordinary photographs,

Botanical Section, Dec. 17th. — Mr. Leipner in the chair. This evening was devoted almost entirely to practical instructions by the president in the use of the microscope, and in the preparation of specimens for future observation, for the benefit of those members who wished to be able to make use of the microscope in Botanical research. The method known as dry mounting was fully explained and illustrated, the question of mounting in fluid being reserved for a future occasion. In most cases it was desirable to surround the object with a cell, or ring, which might be made of cement, cardboard, zinc foil, vulcanite, &c., and then fastened to the glass slide by ordinary liquid or marine glue. In dry mounting, the object was simply placed within this cell, snd covered with thin glass. Frequently, however, the cell was filled up with Canada balsam, in which case it was desirable to soak the object first in turpentine or chloroform, and then to apply a slight degree of heat to cause the balsam to flow freely over the little inequalities of surface. Some large forms of Diatoms from Germany were shown, and Mr. Leipner exhibited some dried fronds of Nifodium molle, Woodwardia radicans, Pteris tricolour, and other ferns, as well as some fine specimens of Funaria hygro metrica, and other mosses in fructification.

F. ASHMEAD,
J. BARBER,
A. NOBLE,
T. H. YABBICOM, } *Sectional Secretaries.*

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the Bristol Daily Post of January 16th, 1865.

The monthly meeting for January was held on Thursday evening last, 12th inst., having been postponed from the 5th on account of the Christmas vacation. There was a fair attendance of members and visitors, including ladies, and the president, Mr. W. Sanders, occupied the chair. After the reading of the minutes, there being no other business to transact, Mr. Handel Cossham read a paper on the pennant formation of the Bristol coalfield. The term pennant was applied to a well-defined band of sandstone occurring between the upper and lower coal measures, which varied very much in colour—dark brown, reddish, and gray, but was very easily worked for paving and other purposes, and was remarkable for the quantity of water it contained in the shape of springs, which rendered the working of coal in or under the pennant more difficult than above it. The coal measures might be roughly divided into three series, 1, the coal itself, of which there were 50 seams at Radstock, with an aggregate thickness of 90 feet. 2, the coal shales, argillaceous strata, which contained the most delicate fossils, and 3, sandstones, of which the pennant was one, specially defined, and below which they were not so numerous, thick, or coarse as above it. The author then stated his belief that the Bristol, South Wales, and Forest of Dean coalfields had in former times been part of one and the same, and showed that the coal itself might be divided into five series, Radstock and Faringdon Gurney, under which came the pennant; and then the Kingswood, Bedminster, and Ashton series, lying upon the Millstone grit, which embraced the whole. With the aid of a map, Mr. Cossham traced the course of the pennant round the Coalpit-heath field, and pointed out how entirely its dip was everywhere conformable with the dip of the coal strata, and that, with a slight exception, the circuit was complete at the surface of the ground, while in the Somersetshire coal field the coal measures were covered by oolite, lias, and new red sandstone, and the pennant only appeared at the surface in two places, owing to upheavals. Near Kingswood a great upheaval had taken place, due east and west, and the pennant had even been denuded; it appeared again, however, at Crew's Hole, and dipped thence under Keynsham into Somerset. Having alluded to the fact that a very rich lode of iron ore had recently been discovered in the pennant at Frampton Cotterell, and that good coal had been found in it in some places, the author proceeded to inquire into the source of this remarkable bed. He was disposed to regard it as having been formed chiefly by the denudation of the old red sandstone, and during the action of a more violent sea than that which assisted to form the coal measures above and below it. It was destitute of fauna, but abounded in remains of hardy and less succulent plants, a list of which Mr. Cossham promised to complete, and forward to the society.

A discussion on this able paper then ensued, in the course of which Mr. Stoddart referred to the presence of mica in the pennant, and of remains of carboniferous limestone. Mr. W. Sanders then spoke of the occurrence of beds of drift coal, and even of pebbles of coal, in the pennant, and in the upper coal measures, which seemed to imply that the lower coal measures had had time enough to consolidate, had then

been partially elevated to form a seashore, battered about, and finally deposited in the upper coal measures. Mr. Cossham, in corroboration of this view, stated that the coals above the pennant were bituminous, and below it anthracitic, and that the pebbles of coal and coal drift found in the upper measures were anthracitic, proving that they must have come from the lower. He also stated his belief, in answer to a question by Mr. Stoddart, that the Severn was at one time wide enough to denude the strata on the side of Coalpit-heath nearest to it.

Mr. W. W. Stoddart then read a paper on Fossil British Land and Fresh-water Mollusca. He commenced by observing that nearly all the shells in fossil collections were of marine origin, for the following reasons:—Marine species were numerically much more numerous than terrestrial, and were placed at their death under much more favourable conditions for preservation, being at once covered by sand or mud, instead of being exposed to the disintegrating effects of atmospheric influences. Many aquatic mollusca, too, were annuals, large numbers being buried each winter, while the terrestrial often lived for two or three years. All the land mollusca belonged to the order Pulmonifera, of which in Britain three-fourths were land and one-fourth fresh-water species, and which embraced all air-breathing mollusca. The breathing organ was simply a large cavity lined with a network of blood-vessels, communicating with the external air by an orifice, closed by the mantle, or entirely open, a difference made use of to separate the order into two divisions—the first, including Helix, Bulimus, Lymnea, Planorbis, was hermaphrodite, and had no operculum; the second, Cyclostoma and Acicula, was unisexual and operculated. The author thus showed grounds for believing that geological formation had not so much to do as was generally supposed in the distribution of the species. Inoperculated pulmonifera had seldom been found earlier than the Wealden, nor operculated earlier than Eocene strata. In the Upper Tertiaries, including all strata from the coral crag to the alluvial and peat deposits, nine species of aquatic bivalves, 34 of aquatic univalves, and 80 terrestrial univalves had been found, the whole taken together indicating that the climate of this country was, very probably, arctic; in addition to this number, the middle Eocene yielded many more. Mr. Stoddart then adverted to the unique collection which he exhibited, containing 150 species of operculated and non-operculated pulmonifera, limacidæ, and fresh water bivalves, as well as a few Gasteropods. The greater part had been collected in Hampshire, Sussex, and Kent, during a period of eight or nine years, and contained nearly all the known genera and species. Many shells from our own neighbourhood, now undergoing fossilisation, resembled very strongly those from the Headon and Hurdwell beds in Hampshire.

After a short discussion, the remainder of the evening was spent in conversation, and the examination of specimens and maps.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

SECTIONAL MEETINGS.

From the Bristol Daily Post of January 23rd, 1865.

GEOLOGICAL SECTION, Dec. 22nd, 1864.—Mr. W. Sanders, president, in the chair. Mr. Keal read a paper on the Cambrian and Cambro-Silurian strata. After giving an account of the progress of geological discovery for the last thirty years, in explaining the nature of the primary and transition rocks of the older geologists, the author stated that from the once confused and neglected transition formations had now been constituted the Cambrian and Silurian systems. The former, called "Bottom Rocks" by Murchison, was exhibited in four great buttresses in Wales and Siluria, the most important being that of Llanberis, which contained the great Carnarvonshire slate-quarries. The Longmynd group, in Shropshire, attained the extraordinary thickness of 21,000 feet, and had hitherto yielded but few certain traces of life. The overlying Lingula zone, called in this paper Cambro-Silurian, was quite unknown till 1846. Its range in the Snowdon district was pointed out on a map, and it was shown to exist on the flanks of each of the four Cambrian elevations. The best locality for fossils from this prius ordial zone was in the neighbourhood of Tremadoc, a small collection from which was exhibited.

Mr. W. W. Stoddart then proceeded to give the Palæontology of the earlier epochs of the earth's history, commencing with the recent discoveries of Sir W. Logan in the Laurentian rocks, and the unexpected discovery of gigantic Foramenifera. The Cambrian fossils were then explained, and specimens or drawings of Oldhamia radiata, Qantiqua, Arenicolites didymees, A. sparsus, Dr. Kinahan's Histioderma, and Salter's doubtful fossil, the Palæopyge Ramsayi, were shown, and their nature discussed. The fossils of the Lingula period were then referred to, and illustrated by a beautiful and complete set of fossils, mostly very rare and of recent discovery; among them were Angelina Sedgwichii, A. subarmatus, Niobe, Hymenocaris, Dictyonema, Theca, Anopolenus, Microdiscus, Holocephalina, and others. The author then explained the nature of Trilobites, pointing out the structural differences between those of various formations, and concluded with a description of the Graptolites, exhibiting a specimen of Diplograpsus pristis found in the Tremadoc strata, at Garth, hitherto not known to exist prior to the Llandello beds. A list of the hitherto discovered Fauna of the Lingula period was given, and a reference made to Messrs. Salter and Hicks's examination of the Lingula rocks, near St. David's.

ENTOMOLOGICAL SECTION, JAN. 10, 1865.—Mr. S. Barton, president, in the chair. Mr. Barton was re-elected president, and Mr. J. Barber secretary, for the ensuing year. Mr. G. Harding read a paper on the Bychidæ. These insects, from their doubtful analogies, occupied an anomalous position, being placed either with the Bombyces or Tineæ, or as a distinct division. The males in the larger species had a bombyciform appearance, and the females in every case were apterous, and in some instances vermiform, the larvæ being invariably case bearers. The Psychidæ were, generally, very local, only five species being at all widely diffused, while sixteen were known in Great Britain, and many undetermined. The three generæ into which they were divided were named Talæparia, Psyche, and Solenobia. Mr. Harding related a remarkable instance of undoubted partherio-genesis in the case of Psyche nitidella, stating also, on the authority of a German entomologist, that no males were ever produced from the eggs of unimpregnated females, and that the fertility only continued for a few generations. Of the genus Solenobia, the sexes of only one species, S.

inconspicuella, were known, and hence none but females being bred, and these all apterous, and hardly distinguishable from each other, it was almost impossible to determine the number of British species. One, however, S. pomonæ, discovered in abundance at Stapleton, by the author, was easily recognisable both in the larval and perfect state. The larvæ of other species occurring in this neighbourhood used to produce both male and female specimens, but for the last few years only females had been bred. Mr. Eddleston, of Manchester, Mr. Doubleday, and Professor Von Siebold, of Berlin, also confirmed the observations of Mr. Harding, who concluded his paper with a minute description of the larva, larva cases, and imago of the various species.

The president exhibited a fine series of Cassida taken by the late Mr. A. Melly, on the Alps.

Chemical and Photographic Section.—Dr. Herapath, president, in the chair. Mr. Noble, the honorary secretary, stated that he had been unable to get any gentleman to furnish a photographic paper for the evening, and he had, therefore, brought for the inspection of members several photographs of guns, shot, shell, targets, &c., which were now being taken in the War Department, Woolwich Arsenal, and preserved for future reference. One in particular, illustrating the effects of shot and shell upon a massive iron target, was exceedingly good. Mr. W. W. Stoddart then read a paper upon the Microscopical examination of iron. After remarking how valuable an auxiliary the microscope was to the qualitative analyst, the author stated that his attention had been drawn to this special use of the microscope in examining iron, from having been requested to give an opinion at very short notice upon the comparative value of several samples of bar iron. He described somewhat in detail the various operations in the manufacture of iron, the first roasting of the ore, and production from it of cast iron by fusion with coal and limestone, and the subsequent reduction of this cast iron in the puddling furnace, after which it was, he said, hammered or rolled into bars, from which the samples referred to were taken. The fractured ends of these bars, under an inch lens, presented a very crystalline structure, intercalated with particles of graphite and glass-like slag, the larger crystals being found in the softest and least compact iron, and the surfaces of these crystals were covered with beautiful lines, always present, and distinct from the fibrous structure of the iron, and most clearly shown in the purest iron. These two characteristics were found to be a very certain guide, and the microscopic indications of the relative amount of impurity in the samples were confirmed by chemical analysis afterwards, the comparative amounts of impurity not, however, corresponding with their relative homogeneity of structure.

Mr. W. L. Carpenter then explained some of the principles of a new system of Chemical Nomenclature, proposed by Professor Williamson, the greatest novelty in which was the restriction of the term acid to those substances usually termed anhydrides, or anhydrous acids, sulphuric and phosphoric for example, while what were commonly considered acids were to be called the hydric salts of these, the only true acids, common oil of vitriol, for instance, being termed hydric sulphate. Hydrochloric acid and its congeners were to be regarded, not as acids, but as salts with acid properties like the salts of gold, platinum, and other neutral metals.

Botanical Section, Jan. 19, 1865.—Mr. A. Leipner, president, in the chair. The accounts for the preceding year were read and passed, and the sectional officers re-elected for the ensuing year, with thanks to them for their services in the past. Mr Lobb read a paper on Himalayan ferns, illustrated by an extremely beautiful and varied collection of these elegant plants, obtained during the Indian mutiny at a station in 35½ degrees north latitude. They varied very much in characteristics and in the temperature under which they lived, some being known in England, and others requiring a much greater heat, and scarcely known here, even in collections. Since the collection had come into his hands the author had endeavoured to identify several of the species, with the help of Mr. Lowe's descriptions, the details of which he read to the section, while the members compared the plant with them. In some instances there was some doubt as to the correctness of the names, dried specimens being difficult to identify. The following, however, were ascertained with tolerable certainty: — Polypodium iriodes, not uncommon. P. subpetiolatum, not well-known. P. hemionitideum, a rare and delicate fern. P. lepidopodum, a handsome and uncommon fern. Adiantum candatum, requiring much heat, and unknown in England. Aspidium mucronatum, scarce. Alsophila ferox, woodwardia radicaus, remarkable for its tendency to form buds; and lastly a nothochlæna, probably N. argentea, a very rare fern, with a beautiful snow-white powder on the under surface of the pinnæ At the conclusion of the paper, Mr. Yabbicom exhibited a series of microscopic preparations of the fructification of these ferns.

F. ASHMEAD,
J. BARBER,
A. NOBLE,
T. H. YABBICOM, } *Sectional Secretaries.*

WM. LANT CARPENTER,
Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the Bristol Daily Post of February 6th, 1865.

The usual monthly meeting was held on Thursday evening last, at the Philosophical Institution, under the presidency of Mr. W. Sanders. There was a good attendance of members and visitors. Mr. A. Leipner, the hon. secretary, announced that Messrs. J. Gould, J. J. Ransom, H. Ferris, P. D. Tuckett, and C. E. Gardner had been elected by the council as ordinary members, and Mr. G. S. Brady, of Sunderland, as a corresponding member.

Mr. H. Ferris exhibited a specimen of the green woodpecker, shot at Clareham, near Yatton, one of many birds which were rapidly becoming rare, from no assignable cause. The president suggested that an investigation into these causes and a list of such birds would form an exceedingly useful communication to the society, and be a very good illustration of how much information might be obtained by a little attention to natural history pursuits.

Mr. W. L. Carpenter, the hon. reporting secretary, then read a paper on gun-cotton. He commenced by regretting that the papers before a society which numbered so many members were so few in number that it was necessary for the officers of the society themselves to provide subjects for the evening meetings, and then alluded to the great attention which the subject he had chosen was now attracting, deservedly, from its numerous applications. Gun-cotton was, he said, a remarkable illustration of the chemical doctrine of substitution, which he had explained in that theatre on a former occasion. As early as 1813 the remarkable action of nitric acid upon lignin, starch, &c., had been noticed, and in 1838 Pelouze, after investigating the properties of this product, then called xyloidin, had suggested its application to artillery. In 1846 Schonbein showed its detonating properties at the Southampton meeting of the British Association, and compared it with gunpowder. Many analyses were then made to ascertain its composition, with unsatisfactory results, and it was reserved for Mr. E. Hadow to publish, in 1854, his valuable and complete researches into this curious substance. Cotton, or cellulose, was composed of atoms of carbon, oxygen, and hydrogen, represented by the formula $C_6H_{10}O_5$. Some of these atoms could not be removed without destroying the very existence of the substance, whilst others could be taken out, provided they were immediately replaced by certain other atoms. In the formation of gun cotton some of the atoms of hydrogen in ordinary cotton were replaced by the same number of atoms of a substance termed hyponitric acid, NO_2, derived from the nitric acid in which the cotton was soaked. There were four definite compounds, with varying quantities of hyponitric acid, according to the degree of concentration of the acid employed. The highest and most explosive, termed chemically "tri-nitro-cellulose," had three of the ten atoms of hydrogen replaced, and this was the compound he specially wished to speak of. The three lower compounds, which were less explosive, were used in the manufacture of collodion, so useful to the photographer and the surgeon, which was simply a solution of gun cotton in a mixture of alcohol and ether. Shortly after Schonbein had announced his discovery, gun cotton was experimented on by a committee of the German Confederation, one of the members of which, Baron von Lenk, continued to devote himself to its study, and in 1852 it was partially adopted by the Austrian Government for artillery, and applied with great success in mining and submarine operations. With some intermissions, partly caused by prejudice against its use, it was employed for some years, and ultimately a committee of eminent scientific men reported most favourably upon it as regarded its stability, explo-

sive properties, &c. In the spring of 1862 full details of its manufacture and applications were communicated by the Austrian Government to that of Her Majesty, and the War-office chemist, Professor Abel, was instructed to experiment and report upon it. In the autumn of the same year a committee of the British Association was named to inquire into the Austrian results, and their report being printed and circulated in 1863, Her Majesty's Government appointed a Committee of Investigation of scientific men, naval and military officers, and engineers. Their report was not yet issued, but so far as was known, the results with English made gun-cotton were fully equal to those obtained in Austria. The manufacture was carried on at the works of Messrs. Thomas Prentice and Co., Stowmarket, who had most kindly placed at Mr. Carpenter's disposal a number of specimens of the various forms in which gun-cotton was now made, illustrating the process, which the author described somewhat minutely. General Von Lenk had superintended the commencement of the manufacture himself, and a compound was now produced, by strict attention to certain precautions, which was perfectly uniform and certain in its results, and not liable to spontaneous explosion. Gun-cotton inflamed at about 300 Fah., and was entirely converted into gaseous products—gunpowder leaving 68 per per cent. of solid residue and only 32 per cent. of gas. In the loose carded form in which it was first known it burnt and exploded very rapidly, producing an enormously destructive force, while its projectile force was very small. Many attempts had been made to diminish the rapidity of the burning, but only successfully by Von Lenk, who had shown that by a proper mechanical arrangement of this wonderful agent, it could be made to develop a force, very gradual in its action, which might be directed and controlled at least as readily as that obtained by the explosion of gunpowder, while, on the other hand, it might be made to exert a violence of action and destructive effect far surpassing that of which gunpowder was susceptible. Mr. Carpenter made some interesting experiments to show the different rate at which gun cotton could be made to burn, from an instantaneous flash to a slow time fuse; and gave some remarkable instances of the effects of gun cotton as compared with gunpowder, showing that it would produce from three to ten times the effect of the latter, according to the nature of the work required. He then pointed out many of the advantages of gun-cotton. The manufacture was much safer than that of powder, as it produced no smoke, much time was saved in mining operations, and in artillery practice in forts, &c., the aim was more sure, and the men could continue longer at their posts; it heated the gun much less, and produced scarcely any recoil. No solid residue being left, the gun was not fouled; it might be wetted and kept damp, and when dried again would be as good as before. Shells might be made much stronger, and be more completely shattered by it, and it also possessed a peculiar local destructive action, unattainable by gunpowder under any circumstances. With respect to its cost, pound for pound, it was dearer than powder, but as it did so much more work it was frequently cheaper. Both had special qualities suiting them for peculiar uses, and the effective cheapness therefore depended mainly on which of the two did best the particular kind of duty required.

The reading of this paper gave rise to much conversational discussion amongst the members. Several objections to the use of gun-cotton were brought forward by Mr. Stoddart, Mr. Ferris, and others, which applied, however, only to Schonbein's product, and not Von Lenk's. Mr. W. P. King mentioned that at the close of the Italian war a large quantity of gun-cotton remained for a long time at the Post-office at Trieste, exposed to heat, &c., without any damage ensuing. The President stated how useful he considered it would be in blasting conglomerate rocks, as gunpowder frequently exploded from the holes as from a gun-barrel, without splitting the rock. Mr. E. A. Praeger gave some interesting details of the mode of military mining, which exemplified the great advantage of gun cotton; and stated that he had recently heard from Prussian and Austrian officers that they were perfectly satisfied with its performances, and should use nothing else.

The President then exhibited a fossil, found in the lias at Kelston by the Rev. Mr. Poynton, which he had been asked to examine. He described the modes of determining the nature of the fossil—proceeding negatively as it were—and gave it as his belief that it was the portion of the stem of an Equisetum, probably Hippurites, which had hitherto only been found of one inch diameter, while the specimen shown was fully double that size. Mr. Leipner was more disposed to regard it as a gigantic reed.

Mr. Leipner, the hon. secretary, made a few remarks upon a specimen of the Lemuridæ lately presented to the Institution, from the West Coast of Africa. The Lemuridæ belonged to the Quadrumana, possessing opposable thumbs, but were the lowest of the class, and the nearest to quadrupeds. This specimen had the forefinger on the fore extremities reduced almost to nothing, only the pharyngeal joint being evident, and on the hinder hands the fore finger had a distinct claw. He believed that it was identical with the Peroditicus Geoffroyi of Bennett, which was described as nocturnal, and living on vegetable diet, though this specimen had a strongly developed canine tooth.

WM. LANT. CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

SECTIONAL MEETINGS.

From the Bristol Daily Post of February 20th, 1865.

Geological Section, Jan. 26—Mr. A. Leipner in the chair.—Mr. W. Sanders was re-elected president, and Mr. F. Ashmead, secretary of the section, for the ensuing year. The accounts for the preceding year were read and passed. It was resolved that the *Geological Magazine* should be taken in, and circulated amongst the members. Mr. W. W. Stoddart continued his paper on the Cambro-Silurian strata and fossils, taking as his subject the Llandeilo formation, which, he said, could not be distinguished lithologically from the lingula beds spoken of at the previous meeting, but which contained an entirely distinct set of fossils, more numerous in species and genera, and of much higher organisation. This series was about 5000 feet in thickness, consisting chiefly of dark fissile slates and sandy flags, and was best observed at the Stipa Stones of Shropshire, Builth, Llangollen, and Llandeilo; the author having also discovered it at Llandewi-Felfrey, 18 miles north of Tenby, where many characteristic fossils were found in great abundance, amongst which were Prinucleus, Didymograpsus, Asaphus tyrannus, and a Discina, probably D. Portlocki, never yet found in this formation. Going on towards Lampeter, near Tenby, the beds were found to be first arenaceous, then calcareous and extensively quarried, forming the only lower Silurian beds in Wales used for lime burning. All the examples of the Llandeilo beds in England were fully explained and illustrated by diagrams. In Scotland the series occurred from Dumfries to the Lammermuir Hills, and contained several species of shells unknown in the Welsh series, but common in the North American. The altered quartzose and gneissose rocks of Sutherlandshire had been recently shown to contain the same annelid tube, Scolithus linearis, as the Shropshire series. In Ireland the Llandeilo beds had not yet been properly made out, but foreign equivalents were described in Bohemia and Scandinavia. Mr. Stoddart gave a long list of the characteristic fossils of this series, remarking that encrinites first made their appearance in it, and exhibited specimens of many of them.

Chemical and Photographic Sections, Feb. 8th.—Dr. W. B. Herapath, president, in the chair.—Mr. Carpenter moved the re-election of the sectional officers for the ensuing year, with thanks to them for their past services. The accounts of the preceding year were read and passed. On account of the small attendance of members, it was resolved that only one of the two papers proposed for the evening should be read, Dr. Herapath's being postponed till the next meeting. Mr. Alfred Noble, the hon. secretary, then read a paper on "Old and New Metals," and modes of obtaining them. Of the fifty metals now known to exist, seven were in use among the ancients; who, after the age of flint implements, used at first those metals which occurred native, as copper, tin, gold, and silver, and then those whose ores occurred in the largest quantity, as iron for example. Referring to the discovery of some of the new metals, thallium, &c., and to the gradual obliteration of the distinction formerly drawn between metallic and non-metallic bodies, the author observed that there appeared to be a simultaneous advance in civilization and in the knowledge of metals. The chief ores of the older metals were oxides, carbonates, and sulphides, and of these the two last could be brought into the state of oxides by heat, which oxides were then reduced or deprived of oxygen by coal, with the

addition of fluxes, and the pure metal was left. The simplicity of this process contrasted strongly with the means now used to obtain some of the comparatively new metals, as sodium, potassium, &c., first obtained by Sir H. Davy in a mercury amalgam with the aid of a voltaic battery, and now prepared by a less expensive, but still very elaborate, series of operations. The manufacture of aluminum and of magnesium, two metals perhaps the most widely distributed of any, was then described in detail, and some of their probable applications suggested. After a slight discussion the meeting separated.

ENTOMOLOGICAL SECTION, FEB. 14.—Mr. Stephen Barton, president, in the chair, who exhibited three longicorne insects, Thryneta leprosa, Fab., taken by the celebrated traveller, Du Chaillu, in Africa; Macrotorna Natala, Bohemaun, taken by Dr. Livingstone; and also a few Australian Lepidoptera. Mr. Hudd exhibited Boarmia perfumaria, Newman, a new species taken in the London district. Mr. Barber, the hon. secretary, then read a paper on the wings of insects. These appendages might be classed in six divisions—elytra, hernelytra, tegmina, membranaceous wings, halteres, and pseudo halteres. When the anterior wings were hard and horny they were called elytra, and the halteres, or balancers, were only found when one pair of wings was absent, of which they were regarded as the representatives. The author then described the wings of each order of insects. In the Coleoptera, or beetles, the elytra were leathery, of various colours, and of no use in flying; the posterior wings were membranous, and the axis of the body was nearly vertical in flight. In the Euplexoptera, earwigs, the posterior wings were very delicate, and folded into a remarkably small space. The Orthoptera had parchment-like anterior wings, but were occasionally deficient in one pair, or possessed both pairs, but of very unequal size. The peculiar noise of crickets was produced by the friction of one wing case upon another, and that of locusts and grasshoppers by the thighs of the hind legs upon the wings. The wings of all other orders were membranous, but the lepidoptera were omitted as being too extensive for consideration that evening. The neuroptera had the forewings very finely reticulated, and were remarkable for the rapidity of their flight and power of turning in all directions. The hymenoptera, bees, had two pairs of naked membranous wings, the hinder smaller, and connected to the forewings by a series of minute hooks. In some of the heteroptera there was a scutellum covering the back, resembling an elytron in appearance. In the diptera, flies, there were two membranous wings only, with halteres constantly vibrating. At the conclusion of the paper much time was spent in the examination of a beautiful series of microscopic preparations of wings, provided by Mr. Barber.

BOTANICAL SECTION, FEB. 16TH.—Mr. Leipner, president, occupied the chair, and delivered an address on the fructification of the Rhodosperm Algæ, or red sea weeds. The higher Algæ were ranged under three divisions, according to their colour, named Chlorosperms, Rhodosperms, and Melanosperms, and the general character of each of these, as to colour and place of growth or region, was given. The Rhodosperms reproduced themselves by two kinds of fructification, which have been found upon all species, but the

two together never upon one plant. The first and simplest kind was by tetraspores, which were simple cells divided into four bodies, either zoned, annular, cruciate, or tripartite, and arranged in groups upon the plants in a great variety of ways. Many examples of these were shown, some in special organs termed sporophylla, which themselves varied greatly in shape and position; others naked and arranged on the ramuli in different ways; others contained in warts, or swollen portions of the frond, and others inside the ramuli and branchlets. The higher mode of fructification was by true spores, allied to seeds, the tetraspores being more analogous to buds. These spores were of various forms, but generally pear-shaped and in simple clusters, then termed favellidia, which also were found in various positions, frequently imbedded in the outer portion of the wall of the frond, or in the interior, or on special branchlets, swollen or otherwise, whence they escaped by their own pressure breaking an opening in the frond. Where these collections of spores were not immersed, and had a special envelope, they were termed favellæ, and found attached to the branchlets with or without peduncles. A higher form of development consisted of a better defined conceptacle, with an inside envelope containing round bodies full of spores, the whole being termed a coccidium, and sometimes imbedded, sometimes external, and forming a tubercle. The most complete reproductive organ was termed ceramidium, which differed from the lower forms in having a well-defined opening for the escape of the spores. It was remarkable that so many different forms of fructification should occur in the same genus, and with such certainty that they could be employed as specific characters. Mr. Leipner illustrated this paper with drawings and microscopic preparations of a very large number of species, which were examined with great interest by the members present.

F. ASHMEAD,
A. NOBLE,
J. BARBER,
T. H. YABBICOM, } *Sectional Secretaries.*

WM. LANT CARPENTER,
Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the Bristol Daily Post of March 6th, 1865.

The thirty-fifth meeting of this society was held on Thursday evening last, March 2nd, at the Philosophical Institution. Mr. W. Sanders, F.R.S., presided over a large attendance of members and friends. The hon. secretary, Mr. A. Leipner, announced the election by the council of the following new members:—Major Tubby, Messrs. S. V. Baker, A. Billings, J. C. Chandler, F. Cordeux, J. S. Hare, H. K. Jordan, G. Phillips, and H. P. Willway, and also stated that a Zoological section had been formed, open to all members of the society on payment of the usual sectional subscription, to meet on the first Wednesday of every month, except the four summer months, at half-past seven in the evening.

Mr. Benjamin N. Lobb then made a verbal communication entitled, "My first experience in Aquaria." He stated that his object was to excite an interest in the study of marine and freshwater animals, similar to that which had been awakened in his own mind, but that he did not possess any very profound knowledge of his subject. His first aquarium had been established at Margate four years previously, the vessel being an inverted cucumber glass, which he had arranged with sea water, pebbles, stones, seaweed, &c., in the manner recommended by Mr. Shirley Hibberd in "Recreative Science," the seaweeds which furnished the most oxygen being the purple or green plants, especially Ulva latissima, Zostera, &c., by the use of which he was enabled to keep the water fresh and pure for a lengthened period, and thus avoided the trouble of changing it. Mr. Lobb then proceeded to describe some of the animals which inhabited what he termed his watery world, and the habits which he had observed. The movements of the fish were very graceful, and the extreme transparency, as well as the great pugnacity of the prawn, very remarkable. The sea-anemones he had obtained were Actinia mesembryanthemum and A. crassicorius, the former common, and multiplying in confinement, the latter more difficult to capture, covering its body with fragments of sand, stone, &c.; the best food for them was the sandhopper. The curious hermit crabs were then noticed, and the battles fought among them for the possession of empty shells amusingly described, as also the cannibal propensities of ordinary small crabs. The small microscopic animals, the medusæ, &c., which caused the phosphorescent appearance in the water, the elegant Beroë, and the delicate Balanus or acorn shell, with its feathery tuft, were then alluded to, the author observing that the wonderful changes which took place and the enormous energy of the animalcules reminded him somewhat of perpetual motion. He then proceeded to describe a fresh water aquarium, in which he preferred to have no vegetation beyond what made its appearance from the water itself. He had kept a large number of the fourteen-spined stickleback, a very handsome and pugnacious fish, many of which had been killed by a boat beetle, itself a very curious and handsome insect. The fish were fed on earthworms, or on aphides, and the eels were remarkable for their enormous voracity, the size of the body being often increased one-third at a single meal. The hydra, with its long tentacles, and development by budding, was then described, and Mr. Lobb concluded with a few observations upon the tendency of such pursuits to open the mind to hitherto unobserved beauties in nature.

A short discussion ensued, Mr. Sanders remarking that familiar observations, like those detailed, were the means by which many profound investigations were commenced. Mr. Stoddart observed that the water at the Hotwells, at high tide, if filtered through paper, answered admirably for marine aquaria, but that the Conferva was better in that case than the Ulva latissima. Mr. Alfred Smith gave an interesting account of the mode in which the thornbacks built nests in which to deposit their eggs, the male keeping

guard over them with a very pugnacious spirit; and he also detailed some curious observations upon the mode in which eels got large masses of food into their bodies.

Mr. T. Graham Ponton then read a paper on the "Functions of the foot of the Conchifera, or bivalve Mollusca," which might be conveniently considered under four heads: its use in locomotion, in burrowing and excavating, in the formation of byssus, and as the seat of the organ of hearing. Many bivalves not only moved slowly, but, as the cockle and Trigonia, were even able to jump by bending the foot. The second function, boring, had only been lately understood. Many molluscs buried themselves as a protection from their enemies; the Solen, or razor-fish, for example, by planting the foot on the sand, and then rapidly rotating, going down several feet. The Pholas was a very common English example of the boring mollusc; the wonderful effects of which had once been attributed to the agency of an acid secreted by the animal, to which theory, as to others, there were many objections. It was now generally acknowledged that the work was done by a rotatory motion, combined with a process of rasping and removal of the particles rubbed off, the requirements for all which processes were beautifully provided for. The foot was exceedingly elastic, owing to the presence of a special organ, the hyaline stylite, and, as well as the mantle and valves, very moveable, certain spoon-like processes, acting as levers, penetrating into the muscles of the mantle and foot. In the rasping, the foot, firmly pressed against the substance to be perforated, acted as a fulcrum to the valves of the shell, which rotated, and when a number of particles had accumulated, the foot suddenly swelled and ejected them with water through the syphons. The next function, formation of byssus, though the most important as far as man was concerned, was but little understood. In England the theory most usually received taught that byssus was the result of a peculiar exudation secreted by a special gland, the locality of which was variously stated. The author had made some experiments upon the common edible mussel: cutting away the byssus, he observed that threads were formed by the contact with and sudden withdrawal of the foot from the glass in which the animal was confined. Close examination of the foot revealed a groove along the base, which served to give form to the threads, and round this groove a glandular structure considered by Rhymer Jones to secrete the material of which the byssus was formed, an opinion confirmed by Mr. Leipner and Dr. H. Fripp. Mr. Ponton had examined the secretion chemically, and found it to resemble in its reactions keratine, a substance found in horn, nail, &c. The last function of the foot, its being the auditory organ, had been first clearly established by Von Siebold, in Cyclas, and since proved to exist in many other genera. Compression of the foot gave evidence of a ganglion, on both sides of the anterior end of which was a small roundish cyst, with a vibrating body, like the otoliths of the higher animals, the receptacle corresponding to the vestibulum membranaceum. Mr. Ponton illustrated his paper with a series of beautiful drawings, as well as living specimens and dissections of the molluscs referred to, procured from Tenby.

A slight discussion ensued upon the use of the byssus, and Mr. Leipner described somewhat in greater detail the structure of the byssal threads. The president, in thanking Mr. Ponton for his valuable and interesting communication, observed that though very short, it contained a mass of information and investigation which might be truly called profound, and was highly creditable to him.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

SECTIONAL MEETINGS.

From the Bristol Daily Post of March 22nd, 1865.

Geological Section, Feb. 23rd.—Mr. W. Sanders, president, in the chair, the attendance of members and visitors being greater than usual. Mr. W. L. Carpenter read a paper on the Eozoon Canadense, the earliest known fossil, recently discovered in Canada—the generic name signifying "dawn life." After a few preliminary remarks upon the circumstances under which the paper was prepared, the author stated that this fossil had been found in a series of beds which had hitherto been considered as destitute of organic remains, and the position of which he described somewhat minutely, in Scotland, in central Europe, where they attained a thickness of 90,000 feet, and in Canada, where they were considered as forming three divisions, Upper and Lower Laurentian, and Huronian, the united thickness of which probably far surpassed that of all succeeding rocks. The presence of organic remains in this series of rocks, both in Europe and America, had long been suspected on mineralogical grounds, but it was not till the winter of 1863-64 that remains were found in the Lower Laurentian limestone, which proved to be undoubtedly organic, from careful microscopical examination. These fossils resembled some of the oldest known corals in external appearance, occurring in large irregularly-shaped masses, but Dr. Dawson, of Montreal, discovered that their structure was most nearly allied to that of the Foramenifera, a group of animals of the very lowest form of organisation, of which, however, the living recent examples were very minute—while these fossils were comparatively gigantic. Specimens had also been very carefully examined by Dr. Carpenter, whose knowledge of this group was exceedingly profound, and who, while corroborating Dr. Dawson on the general reference, had been enabled to work out its affinities more accurately, and was disposed to regard it as of a rather higher type of organisation, considering that it had points in its structure found in three existing orders. The identification of the fossil turned upon minute structural differences, which could not be explained in a short report, but which were made evident by a series of drawings and preparations lent to Mr. Carpenter by his father. A vertical section of the fossil showed the limestone shell, the parts occupied by the animal when alive being filled with serpentine. Since its discovery in Canada it had been found in Ireland, and in the red serpentine of Cornwall, the recognition depending upon structure, only to be seen with the aid of the microscope.—A short discussion ensued, chiefly upon the enormous age of these Laurentian rocks, far exceeding anything previously suspected.

Zoological Section, Feb. 25th.—This was a preliminary meeting to inaugurate the section. Mr. Leipner, as one of the general secretaries, occupied the chair. There was a good attendance of members interested, by whom Dr. Henry Fripp was elected president, and Mr. S. H. Swayne secretary, of the section. The rules for its government were passed, and it was agreed to meet on the evening of the first Wednesday in every month from October to May inclusive, at half-past seven, zoological walks being taken during the summer months.

Chemical and Photographic Section, March 8th.—Dr. Herapath, president, in the chair. The attendance was somewhat more numerous than at previous meetings of the section. The president read his paper, postponed from the February meeting, on Prof. Tyndall's researches on Negative Fluorescence, or Calorescence. He commenced by referring to the three principal divisions of refrangible rays co-existing in the spectrum of the sun, or other intense sources of light, viz., the visible luminous rays, the invisible chemical or actinic or ultra-violet rays, and the equally invisible, heating ultra-red rays, which were the least refrangible of all; and then gave a short account of the manner in which Professor Stokes had, by the use of certain substances, as quinine, uranium, &c., rendered these ultra-violet rays visible, or, in other words, lowered their refrangibility, a phenomenon which he termed fluorescence. The problem just solved by Professor Tyndall was the reverse of this, viz., the increasing of the refrangibility of the invisible ultra-red rays in such a way as to make them also visible, which was done by raising an incombustible body to a state of incandescence by perfectly invisible rays of low refrangibility. The rays from the electric lamp were converged to a short focus by a small concave mirror, and the whole of the light entirely cut off by a solution of iodine in bisulphide of carbon. That the invisible calorific rays were really brought to a focus was readily shown by placing various combustible substances at that point, when they burst into flame, while metal leaf and wire was either inflamed or rendered incandescent, while, strange to say, the human eye suffered no inconvenience when placed in this dark focus, no light or heat being perceptible.

Mr. John Beattie then made a verbal communication upon the Pantascopic Camera. He pointed out that since the first application of photography to landscapes, the great desideratum had been a lens which should have a large angular aperture, to take in a wide expanse of view. The first practical solution of the problem was the fluid globular lens of Mr. Sutton; several others had been proposed, but none had worked well. In the Pantascopic Camera the lens (Grubb's A. O. aplanatic) was made to rotate on a dead perpendicular centre from right to left, while the plate was moved in a rectilinear direction from left to right, the movements being regulated by clockwork. By this contrivance an angle of 120° could be taken with ease, and even the whole horizon of 360° if desired. By means of a peculiar diaphragm, very perfect atmospheric effects of cloud, &c., were obtained, and the action was so rapid, only one-fifth of the usual time of exposure being required, that moving figures in a landscape were perfectly reproduced. Mr. Beattie illustrated his remarks by some very beautiful panoramic photographs taken by this method, and concluded by describing Swan's carbon-printing process, specimens of which were also shown.

Entomological Section, March 14th.—Mr. Stephen Barton, president, in the chair. Mr. Harding exhibited the following species of Lepidoptera:—Lophopteryx Carmelita, the larva of which feeds upon birch, formerly a great rarity, and only taken occasionally now. Gastropacha Ilicifolia, male and female; the larva feeds upon Vaccinum myrtillus; this insect has occurred in England only near Rugby and Sheffield, but is common on the continent. Hyria auroraria, said to have occurred at one time in the Bristol district; the larva feeds on plantain. Ephyra orbicularia, captured at Brighton; Acidalia emutaria, at Lyndhurst; and A. degeneraria, at Portland, by Mr. Harding. A. rusticata. A. ochrata occurs only at Southend, in Essex. The larvæ of the last four species are at present unknown. Alencis pictaria, captured at Dartford-heath. Fidonia carbonaria occurs in Perthshire. The Secretary exhibited fourteen species of the genus Meligethes, and also a series of Carpophilus hemipterus.

Botanical Section, March 16th.—The last evening meeting of the session, the walks commencing next month. Mr. Leipner presided. On the motion of the Secretary, it was resolved that an annual subscription of half-a-guinea should be paid by the section to the library fund. Mr. G. Harding gave a short paper on the ferns of New Zealand, which he illustrated with an extensive and well preserved collection of these interesting plants, gathered in the Auckland district about twelve months before, consisting of 23 genera and 52 species, many showing very singular forms, and comparatively unknown in this country. Two species of Trichomanes were remarkable, T. reniforme having the sori contained in urn-shaped involucres. Lygodium articulatum was a climbing fern, and Asplenium bulbiferum produced young plants on the surface of the frond, some being attached to the specimen shown. A. flabellifolium had the apex of the frond provided with tendrils. Of the six Adiantums, a pretty form was seen in Æthiopecum. Davallia Novae Zealandiae was very elegant. Nephobolus rupestris had a creeping stem, and the fertile fronds of the four species of Lomaria were covered with abundant sori. All the species of Hymenophyllum were beautiful, the pennæ being cut into hair-like segments. Among the tree-ferns were two species of Cyathea—both handsome, C. dealbata having the under surface of the frond of a pale grayish green, and the upper a dark olive. Mr. Harding also exhibited an interesting series of microscopic preparations illustrative of the fructification of some of these ferns.

Mr. B. N. Lobb then brought forward the remainder of the Himalayan ferns, continuing the communication made at the previous meeting upon them. The forms were very beautiful, but mostly unknown in this country, and they could not be named with certainty.

F. ASHMEAD,
S. H. SWAYNE,
A. NOBLE,
J. BARBER,
T. H. YABBICOM,
Sectional Secretaries.

WM. LANT CARPENTER,
Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

From the Bristol Daily Post of April 10th, 1865.

The last ordinary meeting for this session took place on Thursday evening last, April 6th, at the Philosophical Institution. There was a fair attendance of members, and the president, Mr. W. Sanders, F.R.S., occupied the chair.

At the conclusion of the routine business, Mr. Leipner reminded the members of the desirability of taking advantage of the ensuing summer months for the collection and registration of objects of Natural History for the forthcoming publication of the Society, and stated that the authorities of the Institution would be happy to receive and attend to any specimens confided to them for that purpose.

Mr. W. W. Stoddart exhibited a Polysiphonia, which he had found in abundance in a walk in the bed of the Severn, between the piers of the South Wales Union Railway, during a very low tide.

Mr. Alfred Noble, F.C.S., then read a paper on the "Utilisation of Sewage." After some introductory remarks upon the importance of the subject, the source of excreta, and their most valuable constituents, the author stated that the great desideratum was to combine the purely sanitary and the utilitarian lines of investigation in such a way that they should not be opposed to each other. In consequence of the injurious and offensive emanations caused by the oxidation of some of the elements of excreta, the first aim of sanitary reformers had been to remove them as quickly as possible from the vicinity of dwellings, and hence arose the water-carriage system, successful at first, but which, gradually converting rivers into gigantic cesspools, repeated eventually on a large scale the very evils sought to be removed by it. Various schemes had then been proposed, which might be classed under two heads;—firstly, those which precipitated the solid matter from the sewage, and let the clear liquor run into the rivers; secondly, those which advised the pumping of the whole sewage over the land. The precipitation scheme failed, because the most valuable constituents of the sewage were soluble in water, but the irrigation scheme was just now attracting most notice. Mr. Noble then read several extracts from a letter addressed to the Lord Mayor of London on January 19th, 1865, by Baron Liebig, the eminent German chemist, according to whom London sewage contained *daily* 17 tons potash, 15 tons phosphoric acid, 75 tons ammonia, mixed with 750,000 tons of water, together worth £5691. This could be used for irrigation, because the earth abstracted all the valuable ingredients (just as wool or silk abstracted the colouring matter in a dye-bath), but it could only be conveniently applied to grass land. After some further statistics of cost, &c., Mr. Noble then spoke of the successful application of irrigation at the Craigentenny Meadows, near Edinburgh, and contrasted with them the Maplin Sands, which were to be used by the Metropolitan Board of Works, but which, containing no clay, and scarcely anything but sand, would be much more difficult to fertilise. In the opinion of the author too much faith had been placed in the water-carriage system, and his paper stated that dry earth, such as garden mould, mixed with the excreta, entirely prevented the evolution of any noxious effluvia, somewhat resembling charcoal in this respect. The process was first proposed by the Rev. Mr. Moule, of Dorchester, and had been successfully tried in many places. The whole of the fertilising matter was preserved, and the resulting product, which was entirely without smell, could be applied to crops when and where needed —it being possible to use the same earth several times in succession by keeping it dry—and thus a manure of £7 per ton in value could be obtained. Mr. Noble then described the details of various plans proposed for the appli-

cation of this principle, especially urging its trial in manufactories, workshouses, &c., and concluded with a few suggestions for its application on a larger scale, pointing out especially the difference between this plan and the old cesspool system.

Considerable discussion ensued upon this paper, in the course of which much valuable information was elicited. Mr. W. P. King endeavoured to show that the system had long been roughly used in Stafford, Cheltenham, Manchester, &c., where the results were not favourable; but it appeared from other speakers that ashes were employed there, which, being almost entirely silex, or sand, had no deodorising properties. Mr. F. Ashmead considered this scheme the best yet proposed for the utilisation of sewage, saying that he had frequently used peat charcoal with success, the supply of which was limited, while earth was to be had everywhere. He also spoke of the cause of the state of the houses, drains, &c., in St. Jude's, where no cesspools existed. Mr. W. L. Carpenter spoke of his experience of the practical working of the system at the Park-row Certified Industrial School, where the manure had been applied with great advantage in the garden, and urged the desirability of a fair trial of it by members present. Specimens and drawings of the mode of applying the principle to private houses were exhibited by Messrs. White and Co., of London, and a quantity of the manure remained in the room during the meeting without the slightest odour being perceived.

Dr. Henry Fripp then read a portion of his paper on the structure of the eye in the Cephalopod Mollusca. He commenced by some excellent general remarks upon the advantage of the pursuit of philosophic anatomy, gradually bringing the student to see the wondrous unity of design, the perfect attainment of infinitely varied results, and the absolute singleness of purpose evidenced in creation, and then he observed that though the society was strong in several branches of science, there was an absence of labourers in Comparative Anatomy and Zoology, which he greatly regretted, as there was ample room for the labours of the observing pioneer in preparing materials for the more disciplined investigator by the careful collection of well-ascertained facts. Herein lay the great advantage of combination, such as was afforded by the sectional and general meetings of the Society, and Dr. Fripp urged upon the Zoological section the necessity for united action. He then made some observations upon the senses generally, and particularly upon vision, remarking that the eye, considered as an instrument constructed for the transference of rays of light through organic tissues, was essentially the same in design and arrangement throughout all classes of animated beings, and its construction was ever subservient to the physical laws which governed the relations of light, whatever might be the particular adaptation required for any given animal. When we met with animal structures which appeared to oppose these relations, we might be sure that the investigation was incomplete, or the facts misinterpreted; and this was apparently the case in the special instance brought forward. Dr. Fripp then read a description of the anatomy of the eye in the cuttle-fish tribe in Professor Rhymer Jones's text book, and stated that his own observations, differing widely from those details, tended to clear up an acknowledged difficulty in the interpretation of the structures described. He was only able, however, from want of time that evening, to indicate the chief points, and not to demonstrate them fully. It was stated that this eye had no cornea, or iris; but the author exhibited the latter, and showed that the structure of the skin was essentially corneal. Professor Jones said that there was no choroid coat between the retina and the sclerotic, and that in front of the retina there was an incomprehensible opaque black pigment. Dr. Fripp considered this front layer as the true retina, made up of the characteristic rod and stave structure, the pigment being so arranged that every nerve was isolated, the Cephalopod eye

being in this respect more perfect than the human, and he went on to explain the structure of the Crystalline lens, which, in the Loligo, was composed of a spherical lens, and two menisci (a combination used by opticians for certain purposes), but which generally resembled the Coddington lens, a sphere with a groove cut in it, or more strictly, two plano-convex lenses placed together, the groove being filled up and surrounded with an apparatus of tendons, ciliary muscle, &c., the purpose of which was to alter the position of the lenses relatively to the posterior surface of the eye, and thus enable it to perceive objects at different distances distinctly, though not simultaneously.

Mr. Leipner exhibited a specimen of an ordinary rat, recently captured by Mr Charbonnier, in which, probably from a blow in infancy, the incisor teeth had grown in a most abnormal manner, twisting about and re-entering the palate in such a way as entirely to prevent the animal from eating, which must therefore have lived by suction.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS SOCIETY.

SECTIONAL MEETINGS.

From the Bristol Daily Post of April 20th, 1865.

Geological Section, March 30.—Mr. S. H. Swayne in the chair. Mr. W. W. Stoddart called the attention of the members to a fine section of the Lias that was then exposed in the White Ladies'-road, at the back of West Park-road. Numerous fossils had been collected, characteristic of the division known as the Bucklandi series; but the point of most interest in connexion with it was an observation made by Mr. Sanders, who had found in that small tongue of the Lias an anticlinal, or curve of the strata, produced by some disturbing cause. Mr. Stoddart then read a paper on the upper beds of the Lower Silurian series, illustrating it with a complete series of fossils. The Bala beds in Merionethshire were fully described and explained by sections, and the different localities suited for study were pointed out. The beautiful Cystideans and other echinoderms that abounded in these beds were explained, and their analogies shown. After a description of the Caradoc and Lower Llandovery beds, with their fossil contents, the author concluded his paper by giving a brief summary of the early life upon the earth, showing how gradual had been its development, and that as yet not the slightest trace of any vertebrate animal having lived in those immensely distant ages had been found.

Zoological Section, April 5th.—Dr. H. Fripp, president, in the chair. Mr. Th. Charbonnier exhibited a rat which he had recently captured, with most abnormal incisor teeth, which, growing as usual in the Rodents, from a permanent pulp, had become so altered in direction as to pass through the cheek and palate, effectually preventing the animal from closing his mouth, and it must therefore have lived by suction. Mr. E. A. Praeger read a short paper entitled Anatomical objections to hedgehogs sucking cows. After some introductory remarks upon the place of the hedgehog in the animal kingdom, and a general account of its habits, the author said that a characteristic mark of the family was to have the upper fore teeth, two in number, separated, the lower two being contiguous, and that it was quite impossible for any hedgehog to get the teat of a cow into its mouth, on account of its size, and the presence of the teeth, which, it was well known, rendered the withdrawal of the milk a painful operation, it being impossible to remove the milk by any other method than that of suction. Mr. Praeger had had considerable opportunities of observing hedgehogs in Holland, where the tradition had never been heard of, and concluded his paper, which was illustrated with skulls, &c., of various small Insectivora, by some remarks in the change of form in the lips and tongue at the time that young animals ceased to be suckled. In the course of the discussion which followed, Dr. Fripp mentioned that hedgehogs would occasionally lap up milk like a dog. Mr. Leipner then brought forward the subject of the proposed work on local natural history, and expressed a hope that as the Botanical section had undertaken the Botany, so this section would undertake to work the Zoology, except the Insecta, which belonged to the Entomologists. The chief divisions wanted were Mammals, Birds, both

frequenting, or only breeding here, or birds of passage, and Reptiles; Mr. T. G. Ponton having undertaken to do the Fishes of the neighbourhood.

Chemical and Photographic Section, April 12.—Dr. W. B. Herapath, F.R.S., president, in the chair. It was proposed by Mr. Noble, the secretary, and resolved, that at future meetings one subject only should be formally introduced by a member, as a paper or otherwise, and that any member should be at liberty to bring forward a subject for discussion from one of the scientific periodicals. It was also agreed to suspend the meetings of the section in June, July, and August, and some conversation took place about taking photographs of geological strata for the projected work of the society. Mr. P. J. Worsley read a paper on photographing in colour. He said that beginners in photography frequently obtained some amount of reproduction of colour in their negatives, owing to a too great exposure; this, however, was the result of accident, and such negatives were useless for printing from, but Mr. Becquerel had discovered that pure chloride of silver, uncontaminated by iodide or bromide, was sensitive to light in such a way as to reproduce a very decided impression of a coloured spectrum, but the picture could not be fixed, and faded on exposure to light. M. Niépce de St. Victor had pursued the subject, and produced the most sensitive surface by connecting a silver plate immersed in dilute hydrochloric acid with a voltaic battery; a plate so prepared was very sensitive, especially if heated to 30° c., or exposed to sunlight under red glass, and it could be used for several pictures successively. Subsequently he had been able to retard the fading by a mixture of chloride of lead and dextrine, and to take camera pictures with colours reproduced, which could be developed by heat after exposure. The president drew the attention of members to the inapplicability of the magnesium light for portrait photography, its intensity causing a disagreeable expression in the sitter, and said that much of the wire now sold contained sodium, which rendered the light much less actinic. Mr. P. J. Worsley then gave the results of some experiments with dry plates prepared by various processes, showing that Fothergill's albumen process preserved the plates best, those prepared with grape sugar having completely spoiled in the 18 months they were kept. In no case could he obtain a picture without using nitr. silver as a developer. He also described a contrivance for obviating the over exposure of the sky, common in landscape photography.

[The meetings of the Botanical and Entomological sections are suspended, and replaced by excursions.]

F. ASHMEAD,
S. H. SWAYNE,
A. NOBLE, } *Sectional Secretaries.*

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

ANNUAL MEETING.

From the Bristol Daily Post of May 8th, 1865.

The third annual meeting of this society was held at the Philosophical Institution, on Thursday evening last, May 4th, under the chairmanship of Mr. W. Sanders, the president. The minutes of the last annual, and of the last ordinary meeting having been read and passed, the report of the council was read by Mr. W. L. Carpenter. After congratulating the society on its steady progress in scientific attainments during the year, the important and new feature of the establishment of sections was dwelt upon at some length, as most careful consideration had been given to the mode of connexion between the society and the various sections, each of which managed its own affairs, and pursued its own objects, while all were under the regulations of the general council. These sections had been the means of attracting several new members, the total number being now 243 ordinary and 19 corresponding members. The report then spoke of the increased obligations of the society to the Institution, for the accommodation afforded for meetings, books, &c., and expressed a hope that, in the event of the removal of the Institution to another site, the requirements of the society would not be lost sight of, but that an arrangement might be made for a yearly rental of premises. The formation of a library of expensive standard scientific works was then alluded to, and subscriptions in aid of the fund solicited, as well as greater regularity in payment of the general subscriptions. Reference was then made to the registration of objects of natural history undertaken by the society, and it was stated that the first part of the publication would probably be issued in the ensuing summer. All members were urged to assist the project to the best of their ability, assistance being offered by the council and officers of the society. The report then gave a brief outline of the proceedings of the general and sectional meetings during the year, notices of which have from time to time appeared in our columns, and concluded with the hope that the spirit which had rendered necessary the extension of the society's operations in the year just concluded, would continue to animate the whole of the members.

Mr. W. W. Stoddart, the hon. treasurer. read the audited account, showing a balance in hand of £46 11s. 11d., and arrears of subscriptions amounting to £22 15s., an amount which was much to be regretted, as was also the small number of subscriptions to the library fund, £11 5s.

Mr. C. F. Ravis moved, and Major S. H. Tubby seconded, the adoption of the report and account, with a direction that it should be printed and circulated.

Dr. Beddoe moved that a contribution of £15 from the surplus funds in the treasurer's hands should be presented to the Institution, coupled with thanks for the kindness with which the society had been met, and that a further sum of £5 should be spent by the council for the benefit of the museum. The speaker stated that the number of meetings had increased to upwards of 60 in the year, and it was therefore desirable to vote a larger sum than heretofore, but he was sanguine enough to hope that at no very distant

period the society would be in the enjoyment of fresh accommodation at a fixed rental.

Mr. T. G. Ponton having seconded the resolution, it was carried.

Mr. F. V. Jacques moved, and Mr. A. E. Hudd seconded, that Mr. A. Leipner be requested to continue as hon. secretary, Mr. W. L. Carpenter as hon. reporting secretary, and Mr. W. W. Stoddart as hon. treasurer, during the ensuing year.

The meeting was then proceeding to ballot for the election of a president, when Dr. H. Fripp rose and begged to move that Mr. W. Sanders, F.R.S., F.G.S., whose scientific attainments, coupled with so much urbanity, had contributed so largely to the success of the meetings, be requested to continue in his office. The resolution, seconded by Mr. S. H. Swayne, was carried by acclamation.

Mr. Sanders, in thanking the society for the honour thus conferred upon him, said that if scientific knowledge had been alone considered there were several gentlemen equally or more qualified than himself for the position; but he believed he owed his position to the great interest which, it was well known, he took in the promotion of science in others as well as himself, which was most readily done by such societies as this.

The ballot was then taken for two vice-presidents and three members of council, to replace the retiring members. The two secretaries of the society acted as scrutineers, and it was announced that the Rev. Canon Moseley, M.A., F.R.S., and Mr. Thomas Pease, F.G.S., had been elected vice-presidents, and Messrs. David Davies, M.R.C.S., Alfred Noble, F.C.S., and W. P. King, new members of the council.

Mr. T. H. Yabbicom then moved the thanks of the society to its officers and the members of the council for their management of the society's affairs. He said that Dr. Fripp had pointed out how much they were indebted to their president, and that all must feel the value of the labours of their secretaries, Mr. Leipner and Mr. Carpenter, whose work was a very arduous one, as was also that of their treasurer, Mr. Stoddart, in collecting so many arrears. To the other council members, too, they were greatly indebted, for their less obvious but not less useful labours.

The resolution was seconded by Mr. W. Evans, and Mr. Leipner, in acknowledging the vote, spoke of the pleasure it gave him to assist in conducting so harmonious a society, although the work was hard; but he had this year been much assisted in the routine business by his friend Mr. T. G. Ponton. Mr. Leipner then announced that the first excursion this year would be to the Marsh lands, south and east of Clevedon, under the guidance of the Rev. G. W. Braikenridge, and would take place early in June.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

LIST OF OFFICERS,

AS APPOINTED AT THE ANNUAL MEETING, MAY 4TH, 1865.

PRESIDENT:

WILLIAM SANDERS, F.R.S., F.G.S.

VICE-PRESIDENTS:

REV. CANON MOSELEY, M.A., F.R.S., INSTIT. SC. PARIS CORRESP

THOMAS PEASE, F.G.S.

MEMBERS OF THE COUNCIL:

WILLIAM J. FEDDEN.
HENRY E. FRIPP, M.D.
WM. B. HERAPATH, M.D., F.R.S.
STEPHEN BARTON.
F. V. JACQUES.
HERBERT THOMAS.
DAVID DAVIES, M.R.C.S
WILLIAM POOLE KING.
ALFRED NOBLE., F.C.S.

TREASURER:

W. W. STODDART.

HONORARY SECRETARY

ADOLPH LEIPNER, 22 Upper Park Street, Clifton.

HONORARY REPORTING SECRETARY:

WILLIAM LANT CARPENTER, B.A., B.Sc.
2, Great George Street, Bristol.

REPORT.

Another year having elapsed since your Council had occasion, in accordance with its annual custom, to review the proceedings of the Society, and to offer for the consideration of the members suggestions for more completely carrying out its objects, it has again devolved upon them to present a report of the work of the Society during the past twelve months. It gives them much pleasure to do this, believing that very great progress has been made during the past year, in the closer association together of a large number of the members, in a manner more calculated to advance the cause of science, increasing both the interest in, and the work done by, the Society.

At the last annual meeting, the Society increased the number of members on its Council, an alteration which appeared necessary from the amount of work connected with the management of a Society so numerous, and extending its operations in so many directions. The experience of the past year has fully justified the expediency of the step then taken, the older members having been materially aided by the strength thus added, while their individual responsibility has been lessened.

One of the most important features in the growth and progress of the Society this year, and a strong evidence of its desire to make higher attainments in science, has been the formation of Sections, to which those interested in the promotion of special branches of science have attached themselves. Shortly after the last annual meeting a letter was received by your Council, stating that several members of the Society were desirous of pursuing the study of Entomology in greater detail than would be generally desired, and proposing to meet at intervals specially for this object. Your Council felt that this was a new era in the Society's proceedings, considering that the example thus set by Entomologists, would probably soon be followed by members interested in other sciences. They therefore gave most earnest and careful consideration to the manner, in which such a bond of connection might be formed between the Sections and the original Society, as should in no way interfere with the promotion of the objects of the Society at large, at the same time leaving the management of the Section, as far as possible, in the hands of those most immediately interested in its proceedings; and your Council, while expressing the hope that their efforts in this direction have not been in vain, would take take this opportunity of tendering their thanks to the officers of the Sections which have been formed, for the admirable spirit in which they met the views and wishes of the Council, and carried into operation the regulations laid down for their guidance.

It soon became evident that the formation of these Sections met a want which had been widely felt in your Society, for shortly after the establishment of the Entomological Section, similar associations were set on foot for the promotion of Botany, of Geology, and of Chemistry including Photography, and at the commencement of 1865, a Zoological section was added to the list. A tabular statement of the Sections so formed, with the names of their officers, days of meeting, &c., will be found appended to this report. It gives your Council pleasure to be able to state that these sections have been the means of largely adding to the number of members of your Society, several gentlemen having joined it, that they might be enabled to share the advantages offered by one or other of the Sections. The total number of ordinary members is now 240, being an increase of 26 upon the previous year. The number of your Corresponding Members has also been increased by the addition of names of high scientific eminence in their special departments.

The creation of these Sections, each of them holding its meetings monthly in the winter months, and some during the summer also, has necessarily increased the obligations of the Society to the Institution, the Committee of which most readily acceded to the request of the Society for greater accommodation; and your Council would suggest the propriety of presenting a donation of fifteen pounds to the Institution funds, accompanied by a suitable vote of thanks, and an intimation that the Council of the Society are

empowered to spend an additional sum of five pounds for the benefit of the Museum.

Feeling as they do, the great importance of the association of the Society with the Institution, your Council cannot be indifferent to its proposed removal to another site, and they consider that it would be highly conducive to the interests of the Society, to obtain a permanent footing in the new building, for which a proper pecuniary equivalent could be paid yearly.

With the view of meeting a want which was felt by several members, your Council determined during this year to form a Library of such standard scientific works of reference as were not possessed by the Institution, or the Microscopical Society, and whose cost placed them beyond the reach of individual members. Permission to deposit them at the Institution, to the members of which, as well as of your Society, they were to be left open, was provisionally granted by the Institution Committee. Special funds for the establishment of this Library, were obtained in answer to an appeal issued by the Council, who venture to hope that during the ensuing year, a considerable increase will take place, both in the number and the amount of subscriptions for this purpose, which at present vary from 1s., to £1 1s. They consider that, independently of the great importance of possessing such standard works, the accumulation of property is one of the surest means of establishing the Society on a firm and enduring basis.

From the consideration of this question, the report naturally passes to the financial condition of the Society. Your Council have reason to congratulate the members on the state of the Society's funds, but at the same time, they would take this opportunity of calling the attention of members to the very large amount of arrears of subscriptions. At the annual meeting in 1864, more than half of the subscriptions for the year were unpaid, and the Treasurer's account for this year shows £22 15s. in arrear, the total amount of subscriptions of 240 members, being £60. Your Council wish to remind the members that the present state of their funds is in great part owing to the gratuitous exertions of the officers of the Society, and to express the hope that those who enjoy the advantages of membership afforded by the power of attending any of the sectional, general, or excursion meetings of the Society, the facility for consulting books and specimens at the Institution, and the receipt of the printed reports of the past meetings, (the expenditure for which has naturally increased this year) will not fail to recognise the importance of aiding the Society's officers, by giving them as little trouble as possible in the collection of subscriptions, with respect to the non-payment of which, and cessation of membership, your Council have hitherto abstained from recommending the adoption of any rule.

In the last annual report, a reference was made to the proposed work to be issued by the Society, giving

the entire collective natural history of the neighbourhood, including Geology, Palæontology, Mineralogy, Botany, and Zoology. The arrangement of details has occupied much of the attention of your Council, who considered it most desirable that the Society should undertake all risks of the publication; the first part of which will, it is hoped, be issued in the course of the ensuing summer or autumn. It has been decided that the extent of ground covered by the Society's operations, shall be a radius of nine miles round the city, the Palæontology of the Aust Section, as well as the Natural History of Weston-super-Mare and Clevedon being given in appendices; and that the size of the work shall be Octavo, the plates and photographs not exceeding the letterpress in size. Your Council have much satisfaction in stating that they have obtained the valued cooperation of several members in different branches of the work, and they wish to take this opportunity of reminding the Society that the season of the year is now approaching, when Natural History observations are made with the greatest facility, and that every assistance in their power will be afforded by the Council and Officers to those who are willing to undertake one special subject, as several gentlemen have already done, or who have only the opportunity of putting on record occasional observations; because they consider that a work of such a kind and magnitude, can be successfully accomplished only by the united action of a large number of members, and they

therefore earnestly invite the co-operation of all who have the welfare of the Society at heart.

It now remains to take a brief survey of the operations of the Society at its meetings during the past year, both general and sectional, the details of which have been regularly brought under the notice of members by the reports issued by your honorary reporting Secretary, who has been ably assisted in preparing records of the proceedings of the sections by their respective Secretaries. On the whole, your Council have reason to be well satisfied with the success of the meetings of the past year. The attendance has generally been very numerous, on several occasions including a large number of lady visitors, and the great interest taken in the proceedings has been shown by the discussions which have frequently taken place upon the communications made to the Society, and which have seldom failed to elicit much valuable information, and to afford suggestions for the future work of members. Your Council, while observing with very much satisfaction the greater readiness of members to make short communications of interest, (previous notice of which, however, is frequently not given in time for insertion in the summonses of meetings issued to members,) have still to regret the difficulty they experience in finding gentlemen who are willing to prepare papers for the Society, so that it has more than once fallen to the lot of your Secretaries, to provide subjects for the evening, in default of aid from other members,

and they would take this opportunity of reminding gentlemen of the very wide range of subjects embraced by the Society, and that communications on any scientific subject, whether consisting of original observations or of remarks upon the researches of others, are always acceptable.

Since the last annual meeting, three excursion meetings have been held. In June, the excursion of September 1863, was repeated, to the mouth of the Avon along the Port and Pier Railway, for the sake of the members of the Bath and West of England Agricultural Society, then meeting in Bristol. In July, a very successful day was occupied by a visit to the Lias quarries at Street, followed by an exploration of the marsh lands, in the neighbourhood of Glastonbury and Wells, while in August, the Aust Cliff afforded several hours employment to the geologists.

The evening meetings were not resumed till October, on account of the British Association meetings in Bath during September; but on the occasion of the visit of several members of that Association to Bristol, your Society was enabled to assist in rendering the day agreeable to them, by acting as guides to the chief points of geological interest along the banks of the Avon, which were visited by many distinguished men.

At the October meeting, the results of analyses of several samples of well-water in the city, were communicated by Mr. Coomber, and an explanation

of the manufacture of magnesium, with illustrative specimens, given by Mr. Stoddart. Mr. Groom Napier also continued his paper of the previous session on the nidification of British Birds.

At a very full meeting in November, a valuable paper was read by Mr. T. G. Ponton, "On the Land and Fresh-water Mollusca of the Bristol District," which was followed by a most interesting account from Dr. H. Fripp, of his researches into the anatomy of the glow-worm, with special reference to its power of illumination.

The December meeting was occupied by Mr. David Davies, with some excellent remarks upon the Natural History of the Inhabitants of the British Islands, and with the discussion which ensued.

At the January meeting, (held on the second Thursday) Mr. H. Cossham, read a paper upon the pennant formation of the Bristol Coal-field, and Mr. Stoddart exhibited and explained a valuable collection of Fossil British Mollusca, Land and Fresh Water.

The gentleman who had undertaken to supply a subject for the February meeting being unable to keep his engagements, that evening was chiefly occupied by Mr. W. L. Carpenter, with an elaborate account of the manufacture and use of the Austrian Gun-cotton.

At the meeting in March, Mr. B. Lobb gave an interesting description of his experience in aquaria, and Mr. T. G. Ponton, favoured the Society with the

results of his researches upon the functions of the foot in the Conchifera, in a paper well illustrated with diagrams and living specimens.

At the April meeting, Mr. A. Noble, introduced the subject of Sewage utilisation, in a paper, which, advocating strongly the use of dry earth as a disinfectant, gave rise to much discussion; at the conclusion of which Dr. H. Fripp, gave a brief outline of his investigations into the structure of the eye in the Cephalopod Mollusca.

In the Entomological section but few papers have been read, the meetings having been usually occupied with the exhibition and interchange of specimens. Mr. E. C. Reed, who was the Secretary until his departure from England, read, in December, a paper on the Entomology of Australia. At the January meeting, Mr. G. Harding gave an account of the Bychidae, and in February, Mr. J. Barber read a paper on the wings of insects.

The Botanical section has done great good, by disseminating a knowledge of the science under the direction of its president, both in the Botanical walks and at the evening meetings, where specimens have been compared and named, and practical instruction given in the use of the Microscope for botanical purposes. This section has also undertaken to form a herbarium for the use of all members of the Society.

The Geological section has devoted itself chiefly to a systematic study of the various fossils characteristic

of the strata, commencing with the Palæozoic rocks, under the guidance of the president, Mr. Keal, and Mr. Stoddart; and it has been proposed to obtain a large number of sections in the neighbourhood, drawn to scale, with the view of correlating them and thus obtaining the exact position of various beds in the locality.

The business of the Chemical and Photographic section has been mainly confined to the reading and discussion of papers, several of considerable interest; amongst which may be mentioned addresses from its president upon "Solar Power, Radiations, and Emanations," and upon Professor Tyndall's researches on Calorescence; papers by Mr. Noble on the Sewage question, and upon Old and New Metals, and by Mr. W. L. Carpenter, upon analyses of Silicate of Soda; while on Photographic subjects, Mr. P. J. Worsley made an interesting communication upon the conditions of sensibility of Iodide of Silver, and upon photography in colour, the Rev. W. W. Whiting explained his method of Microphotography, and Mr. Beattie explained and illustrated the Wohlthytype and Swan's Carbon-printing process, and the Pantascopic Camera.

The Zoological section has only met twice for the reading of papers, when Mr. E. A. Præger made a communication upon the habits of Hedgehogs, and Dr. H. Fripp gave a microscopic demonstration on the Structure of the Eye in the Cephalopod Mollusca.

Having thus briefly reviewed the proceedings of the Society for the past year, your Council venture to offer

their congratulations to the members upon the great progress made during that period, and to express the hope that the spirit, which has rendered necessary the extension of the Society's operations, will continue to animate the whole body of the members; the present state of affairs being but the commencement of a long and honourable career, and a step towards the high scientific position, which it must be the ambition of all such Societies to attain.

SECTIONS.

ENTOMOLOGICAL.

President, S. Barton. *Secretary*, J. Barber.

Second Tuesday in the month, at 8.0. P.M.

GEOLOGICAL.

President, W. Sanders, F.R.S., F.G.S. *Secretary*, F. Ashmead, C.E.

Fourth Thursday in the month, 7.30. P.M.

BOTANICAL

President, A. Leipner. *Secretary*, T. H. Yabbicom.

Third Thursday in the month, 7.30. P.M.

CHEMICAL AND PHOTOGRAPHIC

President, W. B. Herapath, F.R.S. *Secretary*, A. Noble, F.C.S.

Second Wednesday in the month, 8. P.M.

ZOOLOGICAL

President, H. Fripp, M.D. *Secretary*, S. H. Swayne.

First Wednesday in the month, 7.30. P.M.

In the summer months, many of the evening meetings are replaced by excursions.

All sections are open to any member of the Society, on payment of an annual subscription of 2s. 6d. in each case.

DR. W. W. STODDART, *in Account with* THE BRISTOL NATURALISTS' SOCIETY. CR.

		£	s.	d.			£	s.	d.
1865.					1864.				
	To Balance brought forward	31	5	5	May 11.	By Cash paid Institution	10	10	0
April 29.	To Subscriptions actually received to this date	73	15	0	June 21.	,, Excursion to Shirehampton ...	0	4	4½
					Aug. 25.	,, Somerton & Co....	1	10	0
					1865.				
					Feb. 3.	,, Somerton & Co....	3	5	0
					,,	,, Sturge & Co.	0	19	4½
					Nov. 10.	,, Shrapnell	0	4	6
					,,	,, Morgan	3	13	0
					Apl. 29.	,, Mardon & Co.	15	13	7
					,,	,, Collector	5	3	0
					,,	,, Gratuities, Notices, and Sundry Expenses, per Secretary	17	5	8
						By Balance	46	11	11
		£105	0	5			£105	0	5
	To Balance	46	11	11					
April 29, 1865.	To Arrears of Subs. due Jan. 1, 1865.	22	15	0					
	To Amount received for Library fund	11	5	0					

Audited by
W. JAMES,
T. H. YABBICOM.

LIST OF MEMBERS.

Ashmead, Frederick, C.E.
Atkinson, J. Beavington
Atchley, George F.
Baber, Clement
Badock, William F.
Baker, Septimus Valentine
Barber, J.
Barnes, Francis K.
Barton, John Perry
Barton, Stephen
Barton, W. H.
Bates, John
Beattie, John
Beddoe, John, M.D.
Beddoe, Richard C.
Begbie, Rev. M. H., M.A.
Benham, William, L.L.D.
Bernard, Ralph M., F.R.C.S.
Berry, William
Billings, Alfred
Bisson, Francis P.
Blackmore, Jas. Chanter
Bolt, Henry
Bolt, John
Boorne, Charles
Braikenridge, Rev. G. W., M.A., F.L.S.
Brittan, Alfred
Brittan, Frederick, M.D.
Browne, Samuel Woolcott
Bucklee, Thomas
Budgett, John Payne
Budgett, W. Hill
Burder, George Forster, M.D.
Burder, Wm. Corbett, F.R.A.S.
Burleigh, Alfred, M.R.C.S.
Butler, Cephas
Caldicott, Rev. J. W., M.A.
Carpenter, Wm. L., B.A., B.Sc.
Carter, William G., M.D.
Cayzer, Thomas S.
Challacombe, J. P., M.D.
Chandler, John Moss, L.S.A.
Chandler, Joseph C.
Charbonnier, Henry
Charbonnier, Theodore
Clark, Thos. E., M.R.C.S.
Clark, William
Clarke, J. W.
Clarke, W. Michell, M.R.C.S.
Cole, T. C.
Colthurst, John, F.R.C.S.
Coomber, Thomas, F.C.S.
Cordeux, Frederick
Cossham, Handel, F.G.S.
Crichton, James M., L.R.C.S.
Dando, Charles

Davey, James George, M.D.
Davies, David, M.R.C.S.
Day, Alfred, LL.D.
Derham, James
Derham, Samuel
Down, Edwin
Dunn, Charles Bortill
Evans, William
Exley, John T., M.A.
Fedden, William J.
Fegen, W. B., M.R.C.S.,Surg. R.N.
Ferris, Henry
Fiddes, Walter
Fiddes, William
Fox, Charles Henry, M.D.
Fox, Charles Joseph, M.D.
Fox, Edward Long, M.D.
Fox, Edwin F., M.R.C.S.
Frayne, William
Fripp,Henry E., M.D.
Fry, Francis J.
Gale, Rev. I. Sadler
Garaway, J. R.
Gardiner, George, M.R.C.S.
Gardner, Charles E.
Gibbons, Edwin James
Giles, Richard William
Goodeve, Henry H., M.D.
Gotch, Rev. F. W., LL.D.
Gould, Joseph
Granville, J. Mortimer, L.R.C.P
Greig, Charles, M.R.C.S.
Griffith, Samuel
Grundy, Thomas
Guthrie, Rev. Canon
Halsall, Edward
Harding, George, Jun.
Harding, T. G. Rice
Hare, John Strachey
Harris, Capt. Charles Poulett
Hartland, James
Harvey, Edward
Harvey, James Joseph
Harvey, John, Jun.
Hawkins, Thomas, M.R.C.S.
Hayman, S.
Heaven, Cam Gyde
Herapath, Wm. Bird, M.D.,F.R.S.
Higgins, Edmund T., M.R.C.S.
Highett, Charles, L.R.C.P.
Highett, James, M.R.C.S.
Hill, Charles
Hodges, Edward R.
Howard, Thomas
Hudd, A. E.
Hudson, Charles T., M.A.
Husbands, Henry
Jackson, John Pim
Jaques, F. V.
James, Rev. William
James, William
John, Evan
Johnson, Henry
Jones, Rev. Robert C., B.A.
Jordan, Henry K.
Keal, John
Kerslake, Thomas
King, William Poole
King, Mervyn
Kitt, Benjamin
Lamotte, T. E.
Lang, Robert
Lansdown, F. Poole, M.R.C.S.
Leipner, Adolph
Linton, John
Little, Stephen
Lobb, Benjamin N.
Lunell, John E.

Malthus, Sydenham
Marshall, Henry, M.D.
Martin, Frederick
Martyn, Samuel, M.D.
Masters, Henry
Metford, Joseph S., M.R.C.S.
Miller, Alfred R.
Moore, John
Morgan, Frederick
Morris, J. W., F.L.S.
Moseley, Rev. Canon, M.A., F.R.S.
Moseley, H. N.
Mosely, A.
Naish, Louis
Napier, C. O. Groom, F.A.S.L.
Newton, H. J. W.
Noble, Alfred, F.C.S.
Nunn, E. C.
Ormerod, William, M.R.C.S.
Palmer, Henry Andrewes
Parker, George John, M.R.C.S.
Parker, George John, Jun.
Parson, Thomas Cooke
Parson, Thomas Cooke, Jun.
Parsons, James Gage, L.R.C.P.
Pass, Alfred C.
Pearce, William
Pease, Thomas, F.G.S.
Peck, William
Phillips, George
Plant, Edmund Carter
Pockson, William
Pocock, Rev. Nicholas
Polglase, William
Ponton, Archibald C.
Ponton, Thomas Graham
Pooley, Charles, M.D.
Pope, Thomas
Powell, Septimus
Poynton, Rev. F. J.
Præger, Emil Arnold
Prangley, Arthur
Prichard, Augustin, F.R.C.S.
Ranson, J. J.
Ravis, Charles F.
Roberts, Rev. H. Seymour, LL.D.
Rogers, George, M.D.
Rogers, John Robert
Rowley, Rev. W. W.
Sanders, John Naish, F.G.S.
Sanders, William, F.R.S., F.G.S.
Saunders, Joshua
Sawer, Thomas, M.R.C.S.
Schacht, Frederick
Sheppard, William Y., M.R.C.S.
Sleeman, Philip R., F.R.C.S.
Smart, J. S.
Smith, Alfred
Smith, Rev. Gilbert N.
Smith, William H.
Stansfeld, G. M.
Swayne, Joseph G., M.D.
Swayne, Samuel Hy., M.R.C.S.
Stoddart, W. W.
Tanner, Henry
Tanner, James
Tanner, William
Terrell, William
Thomas, Charles
Thomas, Herbert
Thomas, Richard
Thomas, Thomas
Tothill, William, Jun.
Townsend, Henry H.
Townsend, John Henry
Tubby, Major I. Hardy
Tucker, John Henry
Tuckett, Francis F.

Tuckett, Philip Debell
Turner, Thomas
Tylee, J. P.
Vaughan, Philip Henry
Walcott, William B. L.
Walton, Thomas Todd
Warren, C. W.
Webster, T., M.R.C.S.
West, E. F.
Weston, Andrew
Wethered, Joseph
Whitfeld, Fred. Henry
Whiting, Rev. W.
Whitwill, Mark

Wills, Frederick
Wills, Samuel
Wills, William Henry
Willway, H. P.
Wilson, George Martyn
Wilson, Henry, M.R.C.S.
Wilson, J G., M.D.
Wollaston, Rev. W. C.
Woodward, Augustin
Worsley, Philip John, B.A., F.C.S. *
Worsley, Samuel
Yabbicom, Thomas Henry
York, Frederick
Young, F. Graham

LIST OF CORRESPONDING MEMBERS.

George S. Brady, Esq. Sunderland.
William B. Carpenter, Esq., M.D., F.R.S., &c., London.
Philip P. Carpenter, Esq., B.A., Ph.D., Manchester.
Robert Etheridge, F.G.S., F.R.S.E., Mus. of Practical Geology, Lond.
J. P. Galienne, Esq., Guernsey.
Albert Günther, Esq., M.A., M.D., Ph.D., F.Z.S., British Museum.
T. Rupert Jones, Esq., F.G.S., Professor of Geology and Mineralogy, Royal Military College, Sandhurst.
Edwin Lankester, Esq., M.D., F.R.S., Kensington Museum, London.
Frederick Layard, Esq., late of Ceylon.
Charles Moore, Esq., F.G.S., Bath.
Hugh Owen, Esq., Paddington.
Professor John Phillips, M.A., LL.D., F.R.S., F.G.S., Oxford.
John A. Power, Esq., M.A. and L.M., Cantab.; M.R.C.P., Lond.; F.R.G.S., London.
George E. Roberts, Esq., Somerset House, London.
H. J. Slack, Esq., F.G.S., London.
Rev. Frederick Smithe, M.A., F.G.S., Highley Vicarage.
Frederick Smith, Esq., British Museum.
G. H. K. Thwaites, Esq., F.R.S., Royal Botanic Gardens, Beradenia, Ceylon.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

JANUARY, 1866.

GENERAL MEETING.

THURSDAY, JANUARY 4.—Mr. W. SANDERS, F.R.S., President, in the chair.

The Hon. Secretary announced the following donations to the Library —Lovell Reeve's "British Land and Fresh Water Mollusca," presented by Mr. W. James; "Memoir and Papers of Hugh E. Strickland," presented by Mr. W. H. L. Walcott; "The Food, Use, and Beauty of British Birds," by C. O. Groome Napier, presented by the author.

The PRESIDENT said that it was his painful duty to announce the death of Mr. George E. Roberts, of London, a gentleman who was widely known and respected for his geological researches in the field; and who was one of the Corresponding Members of the Society.

Dr. HENRY FRIPP read an elaborate Essay "On the Function of Sight in Fishes, and on certain Structural Peculiarities of the Fishes' Eye," the subject matter of which was divided into two parts.

The author, briefly alluding to the popular misapprehension respecting the status of the fish in the animal scale, pointed out that under the peculiar physical conditions of fish existence, the different sensory endowments might be expected to vary greatly in functional activity and organic development. Thus the senses of touch and taste, particularly the latter, were relatively undeveloped; those of smell and hearing, being of higher importance, and especially adapted to the medium through which odors and sounds were conveyed, indicated an increased speciality of function; whilst the sense of sight was provided for by an organisation developed on the type common to all classes of the vertebrate kingdom, and exhibited a perfection of construction which corresponded with the extreme importance of the seeing faculty to the active life of the fish. The singular arrange-

ment of a body without limbs, yet adapted to rapid locomotion and dependent on a remarkable development of the muscles of the trunk, was shewn to meet exactly the problem of the progression of an animal immersed in water. The control and direction of this muscular power were shewn to be dependent on the quickness and accuracy of vision. The quantity and quality of subaqueous light were next commented on, and the variation of light in strata of different depths as affected by the different states of the surface waters, *e.g.*, their state of rest and motion, their freedom from turbidity, as also by the state of sunlit or clouded atmosphere; in illustration of which the habits of fish and their power of vision at different depths were considered. The position of the eyes on the head, the direction of the line of vision, and the extent of the sphere of vision in different species of fish, came next under review. The question of the immobility of the pupil, as involving certain views relating to the perfection of the eye as an optical instrument, and to the received theories concerning the accommodation of vision to near and distant objects, was fully discussed, and a comparison instituted between the immoveable iris of the fish and the moveable iris of man and mammalians. The investigations of Brown-Sequard, concerning the contractility of the fishes' iris under the direct stimulus of light, were also noticed; a statement of Gosse respecting the iris of the butterfly blenny was also commented on.

The second part of this essay was devoted to anatomical details of the coats of the eye:—1. the sclerotic and cornea; 2. the choroid, with its ciliary processes, and 3. the choroid "gland" receiving especial notice. The several peculiarities of iris; structure were illustrated by drawings and preparations, the latter being more fully exhibited in the Zoological Section, on February 8th. Some remarks upon the limits of error in, as compared with the certain advantages obtained by, microscopical examination, were made in introducing this portion of the subject. After describing the several structures of the iris and ciliary processes, it was shewn that, both on anatomical and physiological grounds, the immobility of the iris, which had been accepted as a fact derived from general observation, was proved by the absence of muscle tissue in the iris, and the presence of a considerable band of inelastic and non-contractile fibrous tissue, which formed the borders of the pupillary opening. The absence of a ciliary muscle and the undeveloped condition of the ciliary processes were pointed out, as indicating that no function of "accommodation" could be argued on the commonly received theory of a change of position by forward traction of the lens, whilst the equally significant fact of the fishes' lens being too hard and too inelastic to admit any explanation of accommodation by change of the curved surface of the lens, was brought forward in proof of the absence of any such accommodation being produced in the eye of the fish as is observed in the other vertebrata. With respect to the choroid gland, Dr. Fripp, after briefly stating the views of anatomists concerning its structure, demonstrated the purely vascular nature of the gland, and expressed his disbelief in the explanations hitherto given of the function assigned to it, shewing that there existed no relation whatever between the action of the capillaries and vessels of which the gland was composed, and any function of "accommodation." This hypothetical relation was negatived by considering the facts already brought forward in disproof of the assumption that any change of place

or curve of the lens took place, and also by consideration of the static condition of the circulation in the gland, which was intimately connected with the dynamic action of the heart and arteries, and with the varying pressure exercised on the surface of the fishes' body at different depths under the surface of the water. The meaning of this peculiar arrangement of vessels on the choroid gland was thus interpreted, in connection with the risk of injury to which the minute structures within the sclerotic capsule might be exposed, by great variation of pressure or tension of blood in the circulatory system itself, and by the influence of external pressure of water on the cornea of the fishes' eye, which formed a part of the tegumentary covering of the fish.

The following general conclusions were arrived at in a brief summary of the anatomical and physiological points discussed :—

1. That the fishes' vision is perfect for near objects, and that the great refractive power of the lens (a prolate spheroid having great density of substance) is adequate to the production of a defined picture at short focal distance, even when rays of light pass through so dense a medium as water; objects in the air near the water being seen also just as if they touched its surface at the point where the ray is bent.

2. That no "accommodation" such as is known to exist in the human eye for the perfect definition of objects at a distance occurs in fishes—or at least is not provided for in the same manner; the passive state of the fishes' eye being that in which it is enabled to see near objects, no active or physiological change appears necessary for ordinary vision, whilst physical dispersion of light on the water renders distant objects less liable to excite attention.

3. That the iris has no power of reflex action on stimulus of light, and its immobility is in harmony with the optical deficiency of 'accommodation' and the physically deficient illumination of the waters.

4. That the choroid gland is not an organ intended to assist or produce "accommodation" of focal distance of the lens, but that its vascular character, and the absence of any muscular or gland element in its composition, lead necessarily to an interpretation of functions directly relating to the static condition of the circulation fluid, and the changes of dynamic force exerted by the heart under varying pressure from without on the fishes' body. That, in fine, by such an arrangement (analogous examples of peculiarities in the venous circulation of Mammals and other animals dwelling in the water being well known), protection to the delicate tissues of the eye is afforded in the compensating balance of pressure within and without the circulating system.

5. That there results from the globular shape of the eyeball, a secondary reflection of rays of light from the bottom of the eye against the inner pigmented surface of the choroid, which may perhaps intensify the retinal

action, and probably stimulate the cells of the pigment membrane to secrete their molecular pigment from the venous flexuses of the choroid.

The paper was illustrated by a large number of beautiful drawings, by specimens from the Institution Museum, and by numerous microscopic anatomical preparations.

In thanking Dr. Fripp for his exhaustive paper, the President remarked upon the profound thought and the condensation of a large amount of observation displayed in it, and spoke of the honour thus reflected upon the society, as well as of the highest credit being due to the author.

Mr. W. L. Carpenter, the Hon. Reporting Secretary, then read two short communications, the first having reference to Pharoah's Serpents' Eggs, the chemical toy now so common, and gave the results of experiments that he had made to ascertain the composition of the serpent. As was well known, the white powder forming the egg was sulphocyanide of mercury, and the author described several modes of preparing it. Theoretically represented by the formula $H_g\ C_y\ S_2$ it would contain 63.3 per cent. of mercury, and the specimen he analysed yielded 64.9 per cent. The loss of weight on burning was 19.27 per cent., and as the product contained 70.5 per cent. of mercury, it followed that about one-seventh of the mercury in the egg was volatilised. On this account he insisted strongly on the danger of burning them in small rooms with little ventilation, and alluded to the ill effects which had been observed by himself and others to arise from so doing. He mentioned the insidious and distressing symptoms of poisoning by mercury vapour, and described what he believed to be the reason of the fantastic forms and extraordinary increase of bulk sustained by the sulphocyanide of mercury when decomposed by heat. He showed an experiment to prove that the serpent form was not, as was generally supposed, caused by the cone of tinfoil, and described others which led him to believe that the blackness of the inside of the serpent was due to the mechanical mixture of sulphide of mercury with mellon, or melam, products of the decomposition of the sulphocyanides which had been studied by Liebig. The brown exterior contained no sulphide of mercury, and, when treated with nitro-hydrochloric acid, yielded a solution in which sulphuretted hydrogen caused a yellow floculent precipitate, the nature of which he had not ascertained. The specific gravity of the serpent was 0.069, water being 1.000, and such was the continuity of the skin that no air escaped through it when the serpent was sunk in water.

The author's second communication was entitled "Note upon the Artificial Formation of Flint." After briefly alluding to the various natural deposits of silica, and the nature of some of the compounds of silicic acid, Mr. Carpenter said that in decomposing on a large scale a solution of silicate of soda by a mineral acid, on one occasion, the silica which was

at first gelatinous, became quickly agglomerated under water into a very hard semi-transparent mass, resembling flint in its fracture and other respects. The points of interest in connection with it were the conditions under which the transformation took place. He exhibited specimens of flinty silica, which had been formed in a solution at 214° Fah. under a pressure of only three feet of water, in the short space of three hours. He alluded to the possible bearing of this matter upon the explanation of some geological phenomena, usually considered to require extended periods of time for their accomplishment.

Mr. A. Noble mentioned having formed a substance resembling flint by first gelatinising, and then drying in air, an aqueous solution of silicic acid obtained by dialysis. The lateness of the hour, however, prevented further discussion on any of the papers.

MEETINGS OF SECTIONS.

ENTOMOLOGICAL SECTION.

Tuesday, January 9.—Mr. John Bolt in the chair.

After the minutes of the last meeting had been read and confirmed, the members present, in accordance with rule 3 of the section, proceeded to elect a President and Hon. Secretary for the ensuing year. Mr. Stephen Barton was re-elected President, and Mr. George Harding, jun., Secretary.

The Secretary then read the accounts of the section for the previous year, showing a small balance due to him.

CHEMICAL AND PHOTOGRAPHIC SECTION.

Wednesday, January 10.—Dr. W. B. Herapath, F.R.S., in the chair.

After passing the accounts for 1865, the meeting proceeded to ballot for the officers of the section for the ensuing year. Mr. Alfred Noble was elected Hon. Secretary, and Mr. P. J. Worsley, F.C.S., President.

Mr. W. L. Carpenter proposed a vote of thanks to the retiring officers, and Dr. Herapath, in vacating the chair, spoke of the great interest he felt in the section, and his regret at not having been able to devote more time to it, as well as of the good feeling which existed towards himself among all the members.

Mr. Worsley, in assuming office, said that, coming as he did after a man of such genius as Dr. Herapath, he would have to claim the indulgence of the members, though he could yield to no one in an earnest desire to promote the objects for which this section of the Naturalists' Society had been established, and that, although a purely scientific subject was not always attractive, a photographic one ought to be, and it would be his endeavour to render the meetings as generally interesting as possible.

Mr. Worsley then read some notes of observations made by himself and Mr. Gillford on the comparative solubilities of chloride, bromide, and iodide of silver in hyposulphite of soda. 100 parts of this dry salt would dissolve 90 per cent. of chloride of silver, and nearly as much bromide, but only about 5 per cent. of iodide, or, if the solution were heated and allowed to cool, about 6 per cent., the quantity being also influenced by the amount of alkaline iodide present. The solution of chloride or bromide in the hypo contained a double hyposulphite of silver and soda, characterised by a sweet taste, and by being only decomposed with difficulty by boiling; while with the solution of iodide there was no sweet taste, and if an attempt were made to crystallise the solution, pure iodide of silver separated out, showing that it had not been decomposed. Further, there was a great difference in the action of an excess of the halogen salt on the solution. If chloride of potassium were added to a solution of chloride of silver in hyposulphite of soda, no effect was produced; but if iodide of potassium were added to iodide of silver similarly dissolved, a precipitate of iodide of silver was formed, which could only be re-dissolved with very great difficulty by a large excess of hyposulphite of soda. This was very anomalous, and Mr. Worsley could offer no explanation of the fact, nor did any suggestion occur to any member present to account for it.

ZOOLOGICAL SECTION.

Friday, January 12.—Dr. Henry Fripp, President of the section, in the chair.

The audited cash account for the past year was read, showing a small balance in hand. Referring to the six meetings which had been held, the President remarked upon the necessity for more active co-operation on the parts of the members of the section, if it were to be carried on satisfactorily, and hoped that more zeal would be shown in future.

The election of officers of the section then took place, Dr. Fripp being chosen President, and Mr. S. H. Swayne the Hon. Secretary for the ensuing year.

Mr. C. O. Groome Napier exhibited a specimen of Loligo media, found in 1865 at Clevedon, and remarked that these species of Loligo secrete a brown fluid lighter in colour than true sepia. He also showed a male skylark, Alauda arvensis, of abnormal colour, a kind of fawn colour, resembling a cream-coloured lark of South Europe in plumage, but not in the form of the bill.

BOTANICAL SECTION.

Friday, January 19.—Mr. A. Leipner, President of the section, in the chair.

The Hon. Secretary read the accounts for the previous year, showing a balance in hand, which were passed, and a subscription of half-a-guinea was voted to the library fund of the parent society. The officers of the section were then re-elected to their respective departments by acclamation, with thanks for their past services.

Mr. Leipner begged to thank the members for their confidence in him, and said, that although he still felt the greatest interest in the welfare of the section, yet in consequence of his numerous engagements he could not give that attention to its interests which he could have wished, and therefore he should be glad if the members would name some other gentleman to preside over them. It, however, seemed so much the wish of those present that Mr. Leipner should continue to officiate, and attend or otherwise at his convenience, that he kindly consented to do so.

The remainder of the evening was spent in preparing and mounting specimens of dried plants for the herbarium, which is being established by this section. They consisted of plants found within the district of the Bristol Naturalists' Society, which had been either gathered in the course of the field walks of the section during the past summer, or were supplied from the private collections of the members. Each of those present taking a separate department, a large number of specimens, which had been pressed and prepared by the secretary, were mounted and finished.

GEOLOGICAL SECTION.

Thursday, January 25.—Mr. W. Sanders, F.R.S., President of the section, in the chair.

The accounts for 1865 were read and passed, showing a balance in hand,

out of which it was resolved to give a donation to the funds of the Society's Library. The ballot was then taken for the officers of the section, Mr. Sanders being re-elected President, and Mr. F. Ashmead the Hon. Secretary.

Mr. W. L. Carpenter made a short communication on behalf of his father, Dr. Carpenter, on the oldest known fossil, Eozoon Canadense, showing the cumulative evidence, from a great variety of separate probabilities, that its structure was one of animal growth, although its organic nature had been lately called in question, and also announcing the discovery of the same fossil in the limestone beds of the great fundamental Gneiss of central Europe, which Sir R. Murchison had shown on other grounds to be the equivalent of the Canadian Laurentian rocks.

Mr. W. W. Stoddart read some notes on Devonian Palæontology. Remarking that the beginning and end of this system were not characterised by the accession or disappearance of any peculiar fossils, he observed that Silurian fossils were found in the lower Old Red beds, and Carboniferous in the upper, and this was especially the case with the corals, which were very abundant, belonging chiefly to the Cyathophyllidæ. One kind of coral, Calceola sandalina, had by some writers been mistaken for a Brachiopod. In the upper part of the series was a band filled with the valves of Cypridina, an Entomostracon. After giving a general view of the number of species in the system, Mr. Stoddart noticed some as being peculiarly Devonian, *e.g.*, Stringocephalus, Megalodon, Anodonta Jukesii, Clymenia, and others. The Devonian fishes were then described, as all belonging to two of Agassiz's orders, Placoid and Ganoid, and as having generally heterocercal tails, the most curious being the winged fishes, Ptericthys and Coccosteus. No reptiles had been discovered in the Devonian rocks, nor any animal organisms lower than zoophytes. Mr. Stoddart illustrated his paper with a number of the fossils he described, and Major Austin exhibited several also, as well as a sketch and map of the junction of the Devonian and Cambrian rocks in the county of Waterford.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

FEBRUARY, 1866.

GENERAL MEETING.

THURSDAY, FEB. 1st.—Mr. W. SANDERS, F.R.S., F.G.S., President, in the chair.

The Hon. Secretary announced that the following gentlemen had been duly elected ordinary members:—G. Gillford, F. R. Bernard, T. Usher, R. S. Standerwick.

Mr. W. W. STODDART read a note on Involutina liassica, a microscopic fossil, new to the Bristol district. At the Bath meeting of the British Association, Mr. Brady, of Newcastle, had read a paper announcing the discovery of this fossil in the Lias beds at Fretherne cliff and Defford, and had then proposed the above name for it. Mr. Stoddart had been fortunate enough to meet with it at Horfield, and after stating that it belonged to the lowest division of animal life, Foramenifera, he gave a general outline of the characteristics of this group, with the classification proposed by Dr. Carpenter in his monograph, and illustrated his remarks with some photographs projected on a screen by the oxy-hydrogen microscope. In the classification now generally adopted, the whole group was divided into three subordinate groups, named, according to the character of the shell, Porcellanous, Hyaline or vitreous, and Arenaceous: the fossil described by the author belonged to the last division, in structure lying between Rotalina and Trochammina, and considered by Mr. Brady as possibly a pseudomorph of Pulvinulina. In character it was discoidal, biconvex, from 1-15th to 1-70th of an inch in diameter, and 1-48th inch thick—granulated, the outer edge raised—spiral walls, with straight septa.

Mr. Thomas Pease, F.G.S., one of the vice-presidents, then read a paper by the Rev. Gilbert N. Smith, of Gumfreston, on "Recent Researches in a Bone-Cave near Tenby." This cave, called "The Hoils," or Haul's Mouth, was in an undercliff of the mountain limestone, conspicuously facing the sunrise, whence probably its name was derived. Having been long an object of curiosity, it had been much disturbed, and its contents were first reported on at the Oxford meeting of the British Association by the author. The floor was composed of stalagmitic breccia, three or four inches thick, which had long been broken up, except in patches in one or two corners, one of which was broken up for the first time in July last, when two femurs of a bear, still in position, and unquestionably of the oldest bones, were extracted. Among the disturbed earth and stones, half a lower human jaw was found, a good many chert and flint flakes, and, as if to set all speculation of relative age at rest, five unworn Irish harp halfpence of the reign of George III. In October last search was made for the rest of the human skeleton, the plan adopted being to shovel into the light at the entrance all the soil from the beginning of the passage, and in a recess the greater part of the vertebra, the blade bones, radius and ulna, and other remains of the same, or another, human skeleton were found. These, however, had not attained to that increase of weight and peculiar dense fossil character so well known in cave bones. In the disturbed soil in another part of the cave were found two molars of a bear, other carnivorous teeth, and a tusk, also the prong of a deer's antler. In all, 200 flint flakes, including some "scrapers," and two or three "coves" from which they appeared to have been removed, were found, and larger flaky amorphous pieces of the same greenish, spotted, cherty trap, of which the largest flakes were composed. The cave itself had been thrown off and aside, apparently by the elevation of a ridge of the Old Red Sandstone, extending about ten miles between Tenby and Pembroke. A valley, with a rivulet at the bottom, extended at the base of the limestone cliff, and this valley was at the present day liable to be flooded at spring tides. The paper concluded with a few surmises, conclusions, and suggestions offered by Mr. Smith. The limestone having been formed soft and horizontal on the sea bed, and then elevated, all the animals whose bones had been collected in the cave must have lived and multiplied before the sea washed into it again. Also, these remains in general were carried into the cave by the larger Carnivora, though possibly by man, the flint-flake-maker. With respect to the relative date of the deposits, no conclusion could be drawn, except that they continued from the time the cave bear, hippopotamus, &c., were indigenous until the present. As the tumuli on the ridge above the cave contained flint arrow-heads, probably the race of men who used the flints were not far to seek, and *apropos* of flint knives a reference was made to a passage in the book of Joshua, recording the burying of flint (sacrificial) knives in his tumulus. With regard to the thickness of stalagmite, the author referred to the

pendulous incrustations under railway bridges as a proof of quick formation, and he also inferred that floods or large volumes of water must have at times entered the cave to produce the results discovered.

After reading the MS., Mr. Pease, on behalf of the author, submitted to the inspection of the meeting several of the bones, teeth, flint-flakes, coins, &c., found in the cave, which Mr. Smith had forwarded in order to illustrate his paper.

The President, in commenting upon this paper, spoke of the great interest excited by this subject, not only among professed geologists, but among educated persons generally, and observed that, treating the antiquity of man as a purely scientific question, it was difficult to estimate aright the value of such evidence as this. He exhibited some flints from the valley of the Somme, and also some early British spear points, arrowheads, &c., found in 1835, by Mr. Francis and Mr. Gwyn Jeffries, at Paviland, under a thick coat of stalagmite, and presented by them to the Institution Museum. The evidence regarding the length of time required for the formation of stalagmite was very conflicting. Men of moderate views, accustomed to observe carefully, and who were looked-up-to, had come to the conclusion that these flints, &c., were contemporaneous with extinct animals, as well as with animals believed to be far more recent. Though the evidence from the gravel beds might be conclusive, as shown by Mr. Prestwich's researches, that from caves was not so.

Mr. H. K. Jordan, F.G.S., enquired whether the Mollusca found in the cave were Fresh-water or Marine. He described the evidences of a depression of about 40 feet in the land round Tenby, and suggested that many of these bones might have been washed into the cavern by the sea. The speaker also mentioned instances known to him of the varying rate of formation of stalagmite.

Mr. S. H. Swayne, in reply to Mr. Jordan, read an extract from a paper in *The Geologist*, for October, 1865, in which the shells alluded to were described as Marine, and their species named.

Major Giberne (a visitor) spoke of the rapidity with which stalagmites were formed under railway arches, and also of the quickness with which porous limestone used for filtering water became choked. He described a singularly regular oscillation in the level of a portion of land in India during periods of 70 years.

Mr. Leipner explained that the stalagmites under arches arose from the hydrate of lime, which was used in the mortar, and which was many times more soluble in water than the carbonate, being dissolved by the water which trickled through, and that this solution absorbed carbonic acid from the air, forming a stalagmite very different in structure from that which was produced naturally from carbonate of lime.

Mr. Atchley thought, from observations made among the chalk hills

of Wiltshire, that the rate of formation of stalagmite was much influenced by currents of air.

Mr. W. W. Stoddart, F.G.S., referred to Mr. Pengelly's paper on such caves in Cornwall, and mentioned the discovery of a copper pin under nine inches of stalagmite. He also spoke of the great influence of the tide in sorting and arranging cave deposits.

After the conclusion of the discussion, Mr. C. O. Groome Napier, F.G.S., exhibited a specimen of the Spur-winged Plover, a bird common in Egypt, which was known to enter the crocodile's mouth, for the purpose, probably, of removing leeches. It had a remarkably sharp horny spur on the wing, the use of which was not known. It was very cunning, unlike the Dottrell, to which it was allied, and eggs of which were exhibited. This bird, as was well-known, was very foolish, and rarely bred in Britain.

Mr. Pease and Mr. Swayne questioned the existence of leeches, but believed the plover acted as a kind of living toothpick to the crocodile.

Mr. Napier also exhibited a cocoon of the Tarantula spider, from Tobago, which had contained 100 eggs, about the size of rape-seed.

MEETINGS OF SECTIONS.

ZOOLOGICAL SECTION.

February 8.—Dr. H. Fripp, President of the section, in the chair.

Mr. H. K. Jordan, F.G.S., exhibited a series of Helix Virgata, a new variety, of a dusky colour, for which he proposed the name H. Virgata, var. tenebrosa. Also, a series of Helix rufescens, var. depressa, a rare shell, found at Paignton, South Devon, and lately on Durdham-down.

The President then showed and explained a large number of very beautiful microscopic preparations, illustrating anatomically the minute structure of the eyes of fishes. The crystalline lens, choroid coat, and pigment cells, the iris and ciliary processes, were thus minutely examined, and especial attention was drawn to the peculiar arrangement of blood vessels in what was commonly called the choroid gland, the function of which Dr. Fripp had endeavoured to explain in his recent paper read at the general meeting of the Society in January. The separation of the arterial trunk, soon after entering the eye, into an immense number of exceedingly minute capillaries running parallel to each other and most closely packed, was well seen, and the subsequent reunion of these into a so-called venous, but, strictly speaking, arterial sinus, whence the blood was distributed to nourish the tissues of the eye, was clearly demonstrated.

ENTOMOLOGICAL SECTION.

February 13.—Mr. Stephen Barton, President of the section, in the chair.

Mr. Barber exhibited a pair of Hydroporus Neglectus, a new and undescribed Coleopterous insect, taken by Dr. Power (corresponding member); also Ceuthorychus biguttatus, a very rare species, captured by Dr. Power in South Devon.

Mr. J. W. Clarke exhibited a case containing some fine species from India, and the West Coast of Africa.

It was agreed to continue taking in the *Entomological Magazine*, and to bind the volumes, retaining them for reference as the property of the section.

A proposition was made to institute a weekly evening meeting for collecting, during the summer months, and after some discussion, the settlement of the subject was deferred until the March meeting.

BOTANICAL SECTION.

February 15.—Mr. A. Leipner, President of the section, in the chair.

The attendance of members was not very numerous, and the whole of the evening was devoted to the mounting and preparation of specimens for the society's herbarium, no papers or other business being brought forward.

CHEMICAL AND PHOTOGRAPHIC SECTION.

February 15 (postponed from Feb. 14).—Mr. P. J. Worsley, B.A., F.C.S., President of the section, in the chair.

Mr. J. R. Rogers introduced a discussion upon specific heat. After some preliminary remarks upon the varying capacity of bodies for heat, and the meaning of the term specific heat, he raised the question whether there was any relation between the specific heats and atomic volumes of bodies, and pointed out that with many gases, if the numbers representing their specific heats, equal volumes being compared, were divided by the numbers representing their specific heats, equal weights being compared, the quotient was either the atomic weight of the substance, or bore a simple relation to it. Mr. Rogers then suggested as a possible theory of the constitution of matter the hypothesis that the ultimate atoms of bodies were hollow spheres, with heat contained in them, and that the capacity for heat of the substance depended upon the thickness of the films of these hollow spheres.

A short discussion ensued, during which Mr. Beattie, Mr. Noble, Mr. Carpenter, and the President, addressed the meeting.

Mr. W. L. Carpenter then exhibited and explained an adaptation of the spectroscope to the microscope, first suggested by Mr. Sorby, with

which he had made several observations. He described the mode of using the combined instruments, as well as other ways of applying the two together, and promised to show some of the effects produced by it at the next meeting of the section.

GEOLOGICAL SECTION.

February 22.—Mr. W. Sanders, F.R.S., President of the section, in the chair.

Mr. W. W. Stoddart, F.G.S., made a communication upon Ammonites planorbis and its varieties. This was one of the most important, though rare, Lias fossils of the district, and three distinct species of it had been described by Sowerby and D'Orbigny, under the names of Ammonites Johnstonii, Sow., A. torus, and A. tortilis, D'Orb. Dr. Wright, of Cheltenham, who had been much occupied in studying the Ammonites of the Lias, was convinced that these three were simply varieties of one and the same species, A. planorbis. Mr. Stoddart exhibited typical specimens of each, and with the aid of drawings, explained what was meant by the keel, and the suture, stating that the different varieties of the same species were generally the same in the configuration of the sutures. The Lias beds were divided into zones, each characterised by its own Ammonite (which was only found with those limits), as the Planorbis zone, the Bucklandi zone, &c., and A. Planorbis belonging to the group Arietis, which was subdivided into those with no keel, as A. sauzeanus, A. planorbis, &c., and those with a keel, as A. Bucklandi, A. Turneri, &c.

In the conversation which followed, Mr. Jordan, the President, and others, urged the importance of searching for and studying the intermediate links between two strongly marked forms, in order to ascertain what were really species, and what only varieties. British Mollusca generally, Foramenifera, and two fossils, Navicula longicostata and Terebratula ornithocephala, were mentioned as examples of this.

Mr. W. L. Carpenter exhibited a piece of silica, deposited from a boiling solution of silicate of soda, which was being decomposed by a mineral acid. Under a pressure of 2 feet of water it had acquired, in 3 hours' time, in great part, the hardness, semi-transparency, conchoidal fracture, and other characteristics of flint, with which it was chemically identical, except in respect of the quantity of water combined with it.

The President exhibited some tables illustrating various classifications of fish, which he had prepared with the intention of bringing the subject of the fossil fish of the neighbourhood before the section at some future time. Various characters had been taken as bases for classification, some being adapted best for fossil fishes, others for recent. Mr. Sanders had endeavoured to combine both, imparting into Prof. Owen's classification of fossil fish, some of the divisions usually adopted in works of Natural History for recent fish, in order to obtain one adapted to his purpose.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

MARCH, 1866.

GENERAL MEETING.

THURSDAY, MARCH 1.—Mr. W. SANDERS, F.R.S., President, in the chair.

The Hon. Reporting Secretary said that, in accordance with a desire that had been for some time expressed by various members, the experiment had been made of printing the Proceedings of the Society in a more permanent form than that of the newspaper slips. He laid copies on the table, pointed out the advantages of the plan, furnished estimates of the probable increase of cost, and gave notice that the Council would be prepared with a recommendation upon the subject, at the April meeting. In the mean time, he invited expressions of opinion on the matter, from all members interested.

The Hon. Secretary announced donations to the Society's Library of half a guinea from the Botanical Section, and one guinea, with a volume of the *Geological Magazine*, from the Geological Section.

Mr. W. W. STODDART exhibited a piece of bamboo cane, which had been buried in the earth, and then incinerated, showing casts of the siliceous cells in the plant, hanging together in a remarkable manner. He also read an extract from a letter of the Rev. G. N. Smith, in reference to that gentleman's account of researches in a bone cave at Tenby, read at the previous meeting, from which it appeared that, though the bones of the bear, &c., were found underneath the undisturbed stalagmite, and were therefore very old, the flint flakes were not, and hence there were no data for determining the age of these.

Mr. CHARLES F. RAVIS then read a paper on "Amber," communicated by Mr. Philip John Butler, of London. The speaker recalled the fact that about two years ago he had exhibited to the society some beautiful specimens of amber, specially with reference to the insects therein contained, and had then made a short communication upon the subject. These specimens had been lent by Mr. Butler, who had since been pursuing his researches, which were embodied in a paper read at the Linnean Society in London, on December 21st, 1865. This paper Mr. Ravis read, adding also a few remarks of his own in the course of it.

That amber was a fossil resin, and that most of what was obtained at the present day was disrupted from the submerged forests under the Baltic Sea, was now generally admitted. Its resinous character was known in the first century of the Christian era, although some of the ancients adopted the wildest theories respecting it, instances of which were given from Sophocles, Ovid, and other writers. That many of the ancients were wrong in their conclusions was certain, and it was equally certain that many in our own day were equally mistaken in supposing specimens to be amber which were only recent resin. Gum animi frequently contained insects, and was hence often confounded with amber, even in museum specimens, and instances had occurred of some authors, in entomological catalogues, actually mingling fossil species of insects in amber with existing species in modern resins. The weight of the largest piece of amber in the British Museum was 41oz., but at Berlin there were larger specimens. The chief use of amber was in connexion with meerschaum clay, animi being used for varnish.

Mr. Ravis here read some notes on two recent resins, confounded with amber, viz., copal and animi. Copal was the Mexican term for gum as well as resin, the resin so called being the produce of Rhus Copallinum; it rarely or never contained insects. Animi was a product of the Eastern hemisphere only; it exuded from Vateria Indica, a gigantic tree of Malabar, and was formerly sold in Indian bazaars under the term Sundross. The Portuguese knew it in 1498, and on settling in South America in 1549 they misapplied the term animi to the resin of New Spain. In continuing Mr. Butler's paper, the following ready mode of distinguishing amber from animi was given. The specimen being polished, was to be placed in cold water, which should be gradually heated to boiling; animi thus treated, frequently even before the water reached 200°, but always on boiling, lost its brilliancy, and was much altered in appearance and shape, while amber was unchanged. Some instances were given of specimens of amber containing fish, which were evidently manufactured, and not of natural occurrence.

The author then described his microscopic investigations into the cloudiness in amber, an appearance which was due to the presence of an immense number of small cavities, of very various shapes, some containing fluid only, others probably gas, or even vacuity, and others again were filled with fluid which had a bubble of gas in it. Mr. H. C. Sorby, F.R.S., well known for his researches on the microscopic structure of crystals, had examined these, and shown that several gave a black cross with polarised light, indicating a want of pressure, as though the material surrounding the bubble had become somewhat solid and

contracted, so producing a tension. The cloudiness in amber was due, therefore, to the intimate and irregular mixture of air or some gas, or even vacuities, with it; other examples of the same law of light were seen in pounded rock-salt, or the powder of any transparent solid, clouds, condensed steam, foam, &c. Animi very rarely presented this appearance, nor was it probable that any amount of age would produce it. The greater number of these cavities were spherical, usually less than 1-1000th of an inch diameter, and sometimes occurred in waves, but occasionally some were met with more or less resembling in shape a balloon with car attached. The minute structure of these was described, and a comparison instituted with cavities in the diamond, quartz, mellite, and other mineral substances. Reference was then made to the organic remains, as insects, &c., found in amber, the action of chloroform on it described, and the paper concluded with the inference that amber had remained in a viscous state longer than recent resins, and that some specimens under different circumstances were in that condition much longer than others.

The paper was illustrated with several beautiful specimens of animi and amber, and with drawings by Mr. Ravis of some of the microscopic appearances. Mr. C. O. G. Napier also sent specimens of amber from Fezzan, in North Africa, where they were used as money, as well as some picked up on the beach at Margate, which contained insects.

The President, in thanking Mr. Butler for his paper, and Mr. Ravis for reading it, observed that though the cause and nature of these cavities were obscure, he questioned whether they had any relation to the cavities and vacuities in quartz; similar ones were found in granite, and many of them contained water. He also explained that the submerged forests from which the Baltic amber was derived belonged to the Tertiary period.

Mr. Leipner believed, on various grounds, that the cars attached to the balloon-shaped cavities were probably vacuities—the spherical cavities containing a gas or fluid.

Mr. W. L. Carpenter spoke of the vacuities frequently met with in ice, as described by Prof. Tyndall, as well as of the constant presence of air, which was entangled in it, both of which causes rendered it opaque. He also drew attention to the opacity in many specimens of ordinary resin, caused by the intimate mixture of turpentine, which could be expelled by heat, and the resin made clear. As little as 1 per cent. of turpentine equally diffused through the mass, produced this effect.

Mr. W. W. Stoddart described the production of balloon-shaped cavities in Canada balsam (also a resin) when heated on a glass slide for mounting microscopic objects.

Mr. C. O. Groom-Napier's paper on "The Analogy between the Horse and Man," which was announced for this evening, was postponed till the April meeting, to enable the author to be present, and to read it himself.

MEETINGS OF SECTIONS.

ZOOLOGICAL SECTION.

FRIDAY, MARCH 9.—Dr. H. FRIPP, President of the section, in the chair.

Mr. C. O. GROOM-NAPIER communicated notes (by Mr. Tristram), on the Birds of Palestine. After referring to the reasons which have led to the rarity of observations on the Natural History of this region, the author epitomised a portion of Mr. Tristram's paper read at the Bath Meeting of the British Association, in which it was stated that the ornithological interest of this region culminated in the valley of the Jordan, and in the plains around the Dead Sea, a region remarkable as the most depressed portion of the earth's surface. Mr. Tristram had made notes of upwards of 200 species of birds, a large proportion of which were new, and of the remainder some were also European and others Asiatic, this region seeming, by its fauna, to show intermediate characters. The nidification of many had also been observed. Amongst the more noticeable birds might be mentioned the Ceylon Eagle Owl, only previously known in South India and China, the Galilean Swift (new), Smyrna Kingfisher, Palestine Sunbird, Bulbul, Fantail, eighteen species of Chat (allied to the Wheat Ear), two Vultures, several Falcons, &c., &c. A larger proportion of song birds had been observed in Palestine than in Europe, and Mr. Tristram denied the common statement that brightly plumaged birds were deficient in song, *e.g.*, the Sunbird. Many notes on eggs by Mr. Tristram, hitherto unpublished, were read, and about 50 specimens of eggs, and about a dozen nests, exhibited. Mr. Napier said that he had tried to identify some of these birds with the descriptions in the Bible, and amongst other attempts of this kind, spoke of the Crane of the Bible, which he considered to be a Swallow, and said that the Swan of the Pentateuch was thought to be the Purple Coot.

Mr. T. GRAHAM PONTON exhibited specimens of Sepiola atlantioa, a scarce British Cephalopod, found alive at Clevedon last August.

Mr. H. K. JORDAN exhibited a specimen of Scyllarus arctus, a rare crustacean, found at Guernsey by Mr. Gallienne. He observed that it was not mentioned in Bell's "Stalk-eyed Crustacea," and that it was more than double the size of Mediterranean specimens.

ENTOMOLOGICAL SECTION.

TUESDAY, MARCH 13.—Mr. S. BARTON, President of the section, in the chair.

The question respecting the weekly meetings for collecting was first

brought forward, and it was eventually determined that they should be held during the coming summer, to commence in April. It was also determined that the April meeting of the Section should be held in the Institution (instead of an excursion as last year), and that the Sectional excursions should commence in May.

Mr. A. E. Hudd exhibited a pair of Acidalia Mancuniata, a new British species of moth (captured by Dr. Knaggs), and read a few notes upon its habits, and the differences between it and A. Subsericeata, a closely allied species occurring in the Bristol District, a pair of which insect was also exhibited. Mr. Hudd also exhibited Scopula Alpinalis, and Pterophorus Spilodactylus, a rare species occurring in the Isle of Wight.

The Chairman exhibited three species of Coleoptera, belonging to the family of the Paussidæ, a family remarkable for the singular form of the antennæ. The species were C. Piceus, taken by Mr. Barton in Australia (an insect which, Mr. Barton observed, was not only singular from the very peculiar form of the head, but from the fact that it crepitated, when alarmed, like the common Bombardier beetle, Brachinus Crepitans,) Paussus Latrillei, and Paussus Cucullatus, two species which had been sent him by a friend from South Africa.

The Secretary then read a paper upon the Pterophorina occurring in the Bristol District. The Pterophorina were a group of moths easily characterised, the most essential and prominent characters being that the fore-wings were more or less deeply cleft in two, the cleft varying in different species from one fourth to one half or more of the entire length of the wing; the hind wings were split, nearly their entire length, into three distinct parts, the divisions of the wings being surrounded by a thick fringe of long hair, giving them a peculiar feathery appearance, and earning for the genus the popular name of Plume moths. There was probably a larger number of this pretty and interesting group occurring in the Bristol District than in any other of equal area in the Kingdom, as out of 29 British species, the author had captured 17 in the immediate neighbourhood of Bristol, and he thought that probably several others would be found here when the district was more thoroughly searched. Among the species not yet discovered near Bristol, the two following were mentioned as not unlikely to be discovered:—Pterophorus Phæodactylus, an insect occurring abundantly near Gloucester, the larva to be found feeding upon Ononis Arvensis in May, and the Imago in July; Pterophorus Loewii, a recently discovered and obscure species, in the perfect state scarcely to be distinguished from Pt. Bipunctidactylus, a species common round Bristol. The larva of Pt. Loewii fed upon the seeds of Erythrœa Centaurea, a common plant in the vicinity of Leigh and Durdham Down. The paper was concluded by the author entering into particulars as to the habits and food-plants of the larva, and the localities of all the species that had been

taken by him, and it was illustrated by specimens of all the Bristol species, with the food plants of the larva, and with a number of microscopic preparations of the different species.

CHEMICAL AND PHOTOGRAPHIC SECTION.

Owing to the unavoidable absence from Bristol of both the members who had prepared subjects for the evening, and also of the President, the meeting, which should have been held on Wednesday, March 14, was postponed for a month.

BOTANICAL SECTION.

THURSDAY, MARCH 15.—Mr. J. W. CLARK, in the chair.

Mr. YABBICOM exhibited a razor-strop formed of a portion of the pith of a species of Aloe found in Turkey, the adjacent wood being shaped into the form of a handle; he had been led to suspect, from its possessing this sharpening power, that raphides might be present, but from a close microscopic examination, this proved not to be the case, though they were very abundant in the parenchyma of the leaves of most species of this genus. Mr. Yabbicom also showed a portion of bamboo stem, which had been buried, and afterwards burnt, similar to that shown by Mr. Stoddart at the general meeting of the Society in March, exhibiting a cast of the cells of the plant, which, with a lens, was seen to be very complete. Though this appearance might be due in a measure to the presence of local silica in the plant itself, yet he was of opinion that it was chiefly caused by the absorption into the wood of earthy matters, in a state of solution, by capillary attraction from the soil in which it had been buried. Mr. H. Charbonnier had tried the experiment with bamboo which had not been buried, and had failed to produce the same effect.

The remainder of the evening was spent in mounting specimens for the Society's herbarium.

GEOLOGICAL SECTION.

Owing to the engagements of the President, Mr. Sanders, who had undertaken to read a paper, the meeting, which should have been held on Thursday, March 22, was postponed until the following month.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

APRIL, 1866.

GENERAL MEETING.

THURSDAY, APRIL 5.—Mr. W. SANDERS, F.R.S., President, in the chair.

The HON. SECRETARY announced the election, by the Council, of Mr. George Morris and Mr. Edward J. Kingdom as ordinary members, and of Mr. W. Lonsdale as a corresponding member.

The report of the Council respecting the Printing of the Proceedings in a more permanent form than the newspaper slips, was brought forward by the Hon. Secretaries. It recommended that they should be printed in pamphlet form, demy 8vo. size, uniform with several scientific serials, and issued monthly. Also, that all proceedings from the commencement of 1866, should be re-printed in this form, and that, for the present, no special means be taken to meet the increased expense.

Mr. H. K. JORDAN proposed, and Mr. S. H. SWAYNE seconded, the adoption of this recommendation, which was carried unanimously.

Mr. Turner and Mr. E. J. Gibbons were appointed to audit the Treasurer's accounts, before the next annual meeting.

Dr. BEDDOE exhibited specimens of rude flint and stone arrowheads found in a sand-drift at the mouth of the Kowie river, Cape Colony. No other flint was found in that part of Africa, and these implements were not used by the present inhabitants of the country. He also showed a piece of rude Bushmen's pottery, found in a cave not now used, in an uninhabited part of the country.

The PRESIDENT remarked that the majority of these pieces looked like

flakes struck-off in the manufacture of more perfect implements, and adverted to the fact that the same kind of flint was always used for this purpose, even though it must have been frequently brought from long distances, none occurring naturally in the vicinity.

Mr. W. W. STODDART exhibited the new chemical toy, "How to make Green Tea." Red crystallised bichromate of ammonia was heated on a plate of metal over a lamp, and the sesquioxide of chromium which was left, much resembled green tea in appearance.

Mr. T. H. YABBICOM exhibited a fern with fronds of Lastrea spinulosa and L. dilatata growing from the same root, which had originally been brought from Portbury as a specimen of L. spinulosa. These two ferns had been regarded as distinct species, and many considered them even at the present time as separate varieties.

Mr. C. O. GROOM-NAPIER, F.G.S., F.A.S.L., then read a paper entitled "The Horse and his Master: or the Analogy between the Horse and Man." He explained a course of investigation which he had been for a long time pursuing, with reference to "Man the Microcosm,"—how he had been led to examine nature in her lowest and in her highest forms, and how he had found illustrations of man in every department, as a being and as an individual. His paper on the horse was a brief extract from his researches in this direction. He proceeded to draw the analogy between the temperaments of men and horses, and said—

"The sorrel or roan horse, answers to the sanguine temperament in man, which has great working power, but is even more remarkable for the impunity with which it bears long continued fatigue and exposure." He pointed out that horses of mixed colors were the most hardy and enduring, as for instance those with a light colored body and black feet, which answered to light-complexioned persons with grey eyes and black hair. In race-horses the nervous-bilious temperament was illustrated, they united the highest nervous sensibility, the greatest muscular development, and but just sufficient vital force to carry them on at a rapid rate for a short distance. Men he had found whose career resembled that of the race-horse. White horses, he said, were chiefly of the sanguine-lymphatic temperament, which was indicated by fleshiness and softness of muscles, and a liability to certain diseases, in which they shewed a resemblance to a class of very fair men whose hair had a bleached appearance. White horses were altogether less serviceable, but more mild and quiet than the black or chestnut, but shewed the frequent accompaniment of mildness and quietness,—a relative want of spirit. The iron and dappled grey horses, had temperaments analogous to the bilious-lymphatic amongst men. They had great muscular strength, but united with a good deal of stoutness and fleshiness, and at the same time a calmness and steadiness not found in the black and chestnut horses, which were frequently convulsive in their movements. In the black horse he saw a temperament strongly resembling the bilious and its combinations. In the smaller and more delicate breeds the nervous was largely mixed; and in proportion as it was extensively prevalent, so the breed was found to be sensitive and delicate. But

when the bilious was nearly pure, or with a tinge of the lymphatic, as in some mouse-colored horses, there was great muscular power with less excitability. Chestnut horses were of a mixed temperament, greatly akin to the bilious-sanguine, which was less developed in those with black feet. The bilious-sanguine temperament in horses as in men was accompanied by an impatient disposition, but by great strength and spirit. Noble and generous qualities were more common amongst light colored breeds, which united intelligence and strength, and which might be compared with men with yellow hair, whose dispositions were more commonly gentler than those possessing hair of a darker color, and who were also often not deficient in vigour. This yellow hair was an indication of a more evenly balanced temperament than that of black or chestnut horses. The temperament, he said, was but an external indication of the various systems of the body, and when evenly balanced was most commonly accompanied by a good constitution. Hence the great endurance shewn by men and horses with yellow hair, which pointed to this evenly-balanced constitution.

The author then considered the breeds of horses in many countries, and found analogies between them and their masters, in Arabia, Khiva, Egypt, Chaldea, Persia, Armenia, Scythia, and Rome. Roman horses, like Roman citizens, came from an immense variety of localities. The Barbary horses were early brought from that country into Spain, and perhaps contributed eventually to the formation of the jennets, a high-spirited and noble breed. They shewed an extraordinary amount of freedom of movement, and were of the same stock probably as the Lusitanian or Portuguese horses, which, according to Justin, were "born of the winds." These were the types of the Moors—emigrants from Africa—who so greatly contributed to the advancement of civilization in the Peninsula; and they were suitable ancestors of the cavalry of Cortes and Pizarro. The most useful horses were the product of the union of greatly differing breeds. Mr. Napier considered the 'cobs' a type of the middle class amongst men, and proceeded to trace the history of the English breeds of horses, shewing how the state of horseflesh was an index of that of civilization in England at least; and concluded that man who could breed horses and other animals suited to his purpose, and produce modifications in them, in accordance with his will, was bound to apply similar principles to the improvement of his own species, which he had equal power to do. "For all history," he said "informs us how vices, diseases, and short lives are hereditary, and how long life, morality, and intelligence are alike transmitted from parents."

The President, in inviting discussion, said that the author had been very successful in pointing out the analogy sought to be drawn, but he could not quite agree with him in thinking that the horse had been created for man's use. He pointed out that, if concurrently with investigations into the early races of men, search were made as to where other animals were first found, the result would show that, before the earliest man, came into existence those tribes which have since been domesticated by man. Mr. Sanders also pointed out the great anatomical differences between the early geological horse, and the present race, which were so numerous as to cause Prof. Owen to assign a different generic name to the fossil horse.

Dr. Beddoe had no doubt that the analogy was, in the main, a true one, and, as an example, he spoke of the comparison between red-haired men and chestnut horses. Youatt, in his standard work on the horse, considered the dark chestnut horse as equal to any, for a variety of purposes, while the light variety was often weak and delicate, though spirited. The speaker observed that constitution could be predicated from colour more surely in the horse than in man.

Mr. Napier, in reply to an observation from Mr. Lobb, said that it was an established fact that the Arab horse would outstrip the English in endurance, though its swiftness for short distances was not so great.

Mr. W. W. Stoddart, after some humourous observations upon the analogy drawn by Mr. Napier between the "cob breed" and the middle classes of society, each race uniting in a measure the characteristics of two widely differing tribes, said that he thought that the author's observations, to be strictly scientific, should not be so general and wide, and should be taken with great reserve; they should also, as enunciated, be capable of application to other domestic animals, and this he did not consider they were.

Mr. S. H. Swayne confirmed Mr. Sanders' observation upon the early geological horse, which had many characters not exhibited now, rendering it a much less serviceable animal. He was not disposed to explain the resemblance between horses and men so much by analogy, as by the all-mastering and moulding power of the human intellect and will; as examples of this, he instanced the Semitic and Cossack horse and man, and mentioned several other examples of plasticity among the inferior animals. He thought Mr. Stoddart's observations well worthy of attention, especially with reference to dogs, which would probably exceed the horse in plasticity.

Mr. Napier, in replying to some of the above remarks, said he did not wish to be understood as believing that the horse was necessarily created contemporaneously with man.

Mr. Henry K. Jordan, F.G.S., read a paper entitled "A Few Geological Considerations Suggested by the Peculiar Molluscan Fauna Living in the Littoral Zone of the Channel Isles." He pointed out the tendency of modern geology to explain all the phenomena of the earth's crust by causes now in operation rather than by abnormal forces, sufficient time being allowed for them to produce their effects, and showed that there was need of careful investigation, so as not to draw conclusions from only part of a truth, but rather from the broad basis of well-ascertained and corroborated fact. It was generally considered that the depth at which fossiliferous strata were deposited might be ascertained pretty accurately from the character of the fauna found therein, each bathymetrical zone being inhabited by certain characteristic genera or families. The object of Mr. Jordan's paper was to show that this was not so universally true as

was generally supposed, and in support of this view he gave particulars of six well-known British Mollusca, each of which varied greatly in its bathymetrical range.

1. *Venus Casina,* found in the Newer Pliocene deposits, and generally obtained living from the zone of deep water (about 50 fathoms) which girdled the British Isles, had been taken in the Mull of Galloway, in 145 fathoms, and by Mr. Jordan off the Cornish coast in 50 fathoms, in Milford Haven in 6 to 10 fathoms, while on the little island of Hern, opposite Guernsey, it might be found living on the shore among the Zostera Marina.

2. *Buccinum undatum,* was taken in our deepest water, by the Shetland cod-fishermen in 60 to 80 fathoms; it was also readily obtained by the dredge, and found half buried in sand at low spring-tides.

3. *Terebratula caput-serpentis,* like all Brachiopods, inhabited the deep sea, but in the Firth of Clyde might be dredged in a few fathoms, while Rev. M. J. Berkeley had found it between tide marks on the coast of Scotland.

4. *Cyprina Islandica,* essentially a Boreal species, and abundant in the boulder-clay, inhabited the deepest water in the North seas, but further South it was found in shallower water, and in Swansea and Carmarthen bays was taken at low-water mark. Mr. Jordan considered that the probable reason of its living in shallower water as it ranged Southward, was that cold water was its proper habitat, and he inferred that the temperature of the Mediterranean sea, during the glacial epoch, was about the same as the present temperature of the British seas.

5. *Trochus ziziphensis,* occurred at low-water mark at the Channel Islands, was dredged usually in the Laminarian zone, and had been taken in 80 fathoms by Mr. Jeffreys.

6. *Pectunculus glycimeris,* abundant in the Coralline crag, generally considered characteristic of 30 to 50 fathoms depth. Mr. Jordan had dredged it in Milford at from 15 to 4 fathoms, and it abounded so greatly at Jersey at low-water mark, as to be used as an article of food.

Mr. Jordan alluded to several other species, and observed that this interesting phenomenon of deep-water shell-fish living in the Littoral zone, was not confined to Mollusca, and drew the following conclusions from what had been stated—

1. "That bathymetrical range does not influence the distribution of Molluscan and Crustacean fauna so much as the nature and condition of the sea bottom, wherever these are highly favourable, species probably become gregarious."

2. "That geologists cannot even approximately, much less definitely, determine the depth at which fossiliferous strata were deposited, solely on Palæontological evidence."

In the second part of his paper, Mr. Jordan pointed out, from illustrations taken from the Mollusca of the Channel Islands, that great care was necessary in attributing older age to some tertiary strata than others, simply on Palæontological grounds, as Sir Charles Lyell had done in co-ordinating foreign and British tertiaries, wishing to show that the Diestian sands and Bolderburg beds of Belgium were older than the Coralline Crag

of Suffolk, because the former contained many genera not to be found in the latter, and indicating warmer climatal conditions. In the Channel Islands were three genera and three species, all belonging to the Lusitanian type, and not found on the British coast, which would be pronounced to be from the Mediterranean, if shown to a continental naturalist.

The PRESIDENT, after remarking upon the philosophical manner in which Mr. Jordan had treated his subject, observed that it was as difficult to draw true conclusions from exceptional, as from so-called general grounds. He described Prof. Forbes' experiments on bathymetrical zones in the Ægean Sea, which established the general rules, exceptions to which Mr. Jordan had that evening been pointing out. It was true, for example, that the Terebratula, usually a deep-sea shell, was sometimes found in the Littoral zone, but, as a general rule, where these shells abounded in any stratum, it was fair to call that a deep-sea deposit. There were many exceptional cases, also, with the larger Carnivora.

The meeting was closed with the usual votes of thanks to the authors of the papers, and the announcement from the chair that this was the last ordinary meeting of the Session, the annual meeting being held in May, to be followed by the Summer Excursion meetings.

MEETINGS OF SECTIONS.

ENTOMOLOGICAL SECTION.

TUESDAY, APRIL 10.—Mr. STEPHEN BARTON, President of the section, in the chair.

After the minutes of the previous meeting had been read, the PRESIDENT stated that he found upon inquiry that if the magazines were presented to the Society, the section would be able to have access to them for reference at any of the meetings of the section. It was therefore resolved that the volume of both the magazines, when completed, should be bound by the section and presented to the library of the Society.

It was then resolved that the first monthly excursion should take place on Monday, May 7th, to Leigh Woods, the members to meet at the Clifton side of the Suspension Bridge at half-past 3 o'clock in the afternoon. Weekly meetings for collecting were also arranged for Saturday, April 21st, to Leigh, members to meet at the Suspension Bridge at 6.30 p.m.; for Thursday, April 26th, to the Boiling Wells, Stapleton, to meet at the Mill, near the Ashley-hill Station, at 6.30 p.m.

CHEMICAL AND PHOTOGRAPHIC SECTION.

WEDNESDAY, APRIL 11.—Mr. P. J. WORSLEY, F.C.S., President of the section, in the chair.

Mr. W. L. Carpenter exhibited his modification of Mr. Sorby's original form of Micro-spectroscope, in which the prism and achromatic condenser were underneath the microscope-stage, and the slit on a detached stand. He explained and illustrated the method of using it, and pointed out that in this form of instrument, by varying the relative focal lengths of the object-glass and the condenser, the spectrum could be made of any required size in the field of the microscope; but that, on account of the great number of separate moveable parts, the satisfactory manipulation of the whole was very difficult. The spectra of cochineal, blood, cudbear, &c., were shown, and also the mode of using the instrument in actual investigations.

Dr. W. B. Herapath related his experience with Mr. Carpenter's instrument, which he had employed in a Toxicological enquiry, and described the Eye-piece Spectroscope for adaptation to the microscope, as now manufactured by Mr. Browning. The use of this involved scarcely any more trouble than the use of an analyzing polariscope prism, but there was no means of varying the size of the spectrum, and, until very lately, it was much more difficult to compare two spectra simultaneously, than it was in the first described instrument. The speaker described minutely the course of investigation pursued by him with reference to the supposed bloodstains on the hatchet used in the Aberdare murder. Dr. Herapath also showed a number of preparations which he had made in the course of an enquiry into a supposed poisoning case at Malmesbury, where it had been thought that the death of the deceased had been caused by bichloride of mercury. He had obtained mercury from the viscera, &c., sent to him for examination, but in no case was it in the soluble form, but almost entirely in the metallic state, or as sulphuret, and as he was not aware of any reducing agent in the body sufficiently powerful to bring mercury to the metallic state from its chloride, he concluded that the mercury found, resulted from the absorption of medicinal preparations of mercury, administered in a perfectly ligitimate manner.

The President showed a number of photographs which, when mounted with starch, became covered with yellow spots, and asked the members present their opinion upon the cause of them, and the possible means of preventing them from occurring.

ZOOLOGICAL SECTION.

Thursday, April 12.—Dr. Henry Fripp, President of the Section in the chair.

Mr. C. O. Groom-Napier exhibited an interesting series of bones of the Dodo, chiefly leg-bones, and read an extract from the *Mauritius Commercial Gazette,* quoted in the *Zoologist* for February, 1866, with

reference to them. It appeared that they had been recently found in alluvial deposits in that island under three feet of water and mud, after unsuccessful researches in drier localities, and that bones of the tortoise, deer, and flamingo, were discovered at the same time and place. Nearly every bone of this remarkable bird had been obtained there, except the toes and part of the beak. The skull was very thick, and the cerebral cavity small; the cervical vertebræ were especially worthy of attention, the spinal cord being fully double that of a turkey in size; the sternum resembled that of the pigeon tribe, and the leg bones were remarkable for their size, some of the femurs being 7 inches in length.

Mr. A. Leipner then made a communication upon "Asexual Reproduction." The speaker had been led to consider the subject, by reading some recent researches of Leuckart on the Cecidomyde larvæ, a race of two-winged flies, which, depositing their eggs in the buds of plants, produced galls. Between the 9th and 10th segments of the larva appeared a 'germ-stock,' which, after going through several stages, finally developed into a number of larvæ, precisely resembling the original one, which ate their way out of the parent's body, causing its death. These again produced others, and so on, until June, when the larvæ went through the usual metamorphoses, and the resulting insects, after copulation, laid eggs, which developed in the usual manner. The only parallel condition to this was in the Aphides, or plant-lice, where this successive production of larvæ without sexual organs had been continued for four years, but any great fall in the temperature caused a full development of the larvæ, followed by sexual reproduction, to take place. Leuckart had adopted Steenstrup's term for this phenomenon, 'alternation of generations.' In his treatise on Development, M. Quatrefages described three modes. (1.) True Metamorphosis, which affected only one and the same individual. (2.) Geneagenesis, or the production of several generations through the medium of a single germ, and (3.) Parthenogenesis, or the reproduction of perfect eggs from an unfecundated perfect female; as had been long noticed among bees, and as frequently occurring in the vegetable kingdom. Mr. Leipner considered the reproduction of the Aphides and Cecidomydae as coming under the second head, geneagenesis, as no perfect eggs were produced, nor was the reproducing individual a perfect insect; the process, in fact, was only a modification of the phenomenon of gemmation or budding, examples of which he adduced from among many of the lower tribes, Coelenterata, Radiata, Annulosa, Mollusca, &c. The speaker hoped at a future time to present a classification of animals founded upon their modes of reproduction, according to the divisions laid down by Quatrefages.

BRISTOL NATURALISTS' SOCIETY.

ANNUAL MEETING.

From the Bristol Daily Post of May 8th, 1865.

The third annual meeting of this society was held at the Philosophical Institution, on Thursday evening last, May 4th, under the chairmanship of Mr. W. Sanders, the president. The minutes of the last annual, and of the last ordinary meeting having been read and passed, the report of the council was read by Mr. W. L. Carpenter. After congratulating the society on its steady progress in scientific attainments during the year, the important and new feature of the establishment of sections was dwelt upon at some length, as most careful consideration had been given to the mode of connexion between the society and the various sections, each of which managed its own affairs, and pursued its own objects, while all were under the regulations of the general council. These sections had been the means of attracting several new members, the total number being now 243 ordinary and 19 corresponding members. The report then spoke of the increased obligations of the society to the Institution, for the accommodation afforded for meetings, books, &c., and expressed a hope that, in the event of the removal of the Institution to another site, the requirements of the society would not be lost sight of, but that an arrangement might be made for a yearly rental of premises. The formation of a library of expensive standard scientific works was then alluded to, and subscriptions in aid of the fund solicited, as well as greater regularity in payment of the general subscriptions. Reference was then made to the registration of objects of natural history undertaken by the society, and it was stated that the first part of the publication would probably be issued in the ensuing summer. All members were urged to assist the project to the best of their ability, assistance being offered by the council and officers of the society. The report then gave a brief outline of the proceedings of the general and sectional meetings during the year, notices of which have from time to time appeared in our columns, and concluded with the hope that the spirit which had rendered necessary the extension of the society's operations in the year just concluded, would continue to animate the whole of the members.

Mr. W. W. Stoddart, the hon. treasurer, read the audited account, showing a balance in hand of £46 11s. 11d., and arrears of subscriptions amounting to £22 15s., an amount which was much to be regretted, as was also the small number of subscriptions to the library fund, £11 5s.

Mr. C. F. Ravis moved, and Major S. H. Tubby seconded, the adoption of the report and account, with a direction that it should be printed and circulated.

Dr. Beddoe moved that a contribution of £15 from the surplus funds in the treasurer's hands should be presented to the Institution, coupled with thanks for the kindness with which the society had been met, and that a further sum of £5 should be spent by the council for the benefit of the museum. The speaker stated that the number of meetings had increased to upwards of 60 in the year, and it was therefore desirable to vote a larger sum than heretofore, but he was sanguine enough to hope that at no very distant

period the society would be in the enjoyment of fresh accommodation at a fixed rental.

Mr. T. G. PONTON having seconded the resolution, it was carried.

Mr. F. V. JACQUES moved, and Mr. A. E. HUDD seconded, that Mr. A. Leipner be requested to continue as hon. secretary, Mr. W. L. Carpenter as hon. reporting secretary, and Mr. W. W. Stoddart as hon. treasurer, during the ensuing year.

The meeting was then proceeding to ballot for the election of a president, when Dr. H. FRIPP rose and begged to move that Mr. W. Sanders, F.R.S., F.G.S., whose scientific attainments, coupled with so much urbanity, had contributed so largely to the success of the meetings, be requested to continue in his office. The resolution, seconded by Mr. S. H. SWAYNE, was carried by acclamation.

Mr. SANDERS, in thanking the society for the honour thus conferred upon him, said that if scientific knowledge had been alone considered there were several gentlemen equally or more qualified than himself for the position; but he believed he owed his position to the great interest which, it was well known, he took in the promotion of science in others as well as himself, which was most readily done by such societies as this.

The ballot was then taken for two vice-presidents and three members of council, to replace the retiring members. The two secretaries of the society acted as scrutineers, and it was announced that the Rev. Canon Moseley, M.A., F.R.S., and Mr. Thomas Pease, F.G.S.. had been elected vice-presidents, and Messrs. David Davies, M.R.C.S., Alfred Noble, F.C.S., and W. P. King, new members of the council.

Mr. T. H. YABBICOM then moved the thanks of the society to its officers and the members of the council for their management of the society's affairs. He said that Dr. Fripp had pointed out how much they were indebted to their president, and that all must feel the value of the labours of their secretaries, Mr. Leipner and Mr. Carpenter, whose work was a very arduous one, as was also that of their treasurer, Mr. Stoddart, in collecting so many arrears. To the other council members, too, they were greatly indebted, for their less obvious but not less useful labours.

The resolution was seconded by Mr. W. EVANS, and Mr. LEIPNER, in acknowledging the vote, spoke of the pleasure it gave him to assist in conducting so harmonious a society, although the work was hard; but he had this year been much assisted in the routine business by his friend Mr. T. G. Ponton. Mr. Leipner then announced that the first excursion this year would be to the Marsh lands, south and east of Clevedon, under the guidance of the Rev. G. W. Braikenridge, and would take place early in June.

WM. LANT CARPENTER,

Honorary Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

SECTIONAL MEETINGS.

From the Bristol Daily Post of May 24th, 1865.

Entomological Section, April 24th.—The first excursion meeting of the season was held, and the members visited Leigh Woods, by permission of Sir William Miles. Although the weather was favourable, no rare species were taken—nor, indeed, anything worth recording.

Botanical Section, April 26th.—The first botanical walk of the season took place, under the direction of the president, Mr. A. Leipner, to St. Ann's Wood, near Brislington. On the slope leading into the valley the pale flowers of Cardamine pratensis were plentifully scattered, intermixed with the solitary white perianths of Anemone nemorosa. The tall red stems and pale green umbels of Euphorbia amygdaloides showed conspicuously in company with the handsome flowers of Stellaria holostea, and occasionally an unrolled sheath of Arum maculatum disclosed its curious spadix. Luzula sylvatica and L. pilosa were also scattered about, and later in the course of the walk was found an abundance of L. campestris. On the bank by the side of the footpath near the brook Oxalis acetosella, Adoxa moschatellina, and Orobus tuberosus were picked; Fragaria vesca was also seen, though Potentilla fragariostrum, a plant somewhat resembling it, was much more plentiful. Hyacinthus non-scriptus was found in beds of several hundred plants, and on the open ground Lamium album was very abundant, far more so than its archangelic brother Galeobdolon luteum. On the surface of the water were seen the wrinkled leaves of Potamogeton crispus not yet in flower, and on the open waste land near St. Ann's, Sisymbrium thalianum, as well as a few patches of the small chameleon-like Myosotis versicolor, and later in the day Sarothamnus scoparius was picked.

Zoological Section, May 1. — Dr. Henry Fripp, president, in the chair. At this, the last evening meeting of the season, Dr. Fripp exhibited a series of microscopic preparations, illustrating his paper, the introductory portion of which had been read at the April general meeting of the society, on the structure of the eye in the Cephalopod Molluscs, and he pointed out the several variations of structure which distinguish this organ from the vertebrate eye. The change in character of the dermal covering in front of the lens was first noticed, and the simplification of histological elements, as well as the general assimilation of structure and character to that of the cornea in Vertebrata, was demonstrated by preparations. The arrangement of the compound crystalline lens was next explained, while its attachment to the sclerotic coat, and in particular to a thick ring of ciliary muscle, by means of peculiar forms of fibrous and cartilaginous tissues, was dwelt on at some length, the anatomical relations being found in this part to be extremely complicated. Lastly, the structure of the remaining parts of the sclerotic was shown, as also the manner in which bundles of optic nerve fibres passed through its perforated cartilaginous portions at the back of the globe. The presence of a cushion of coarse fibrous tissue developed by growth of small nucleated cells from the surface of the sclerotic was pointed out, which was shown to line the perforated channels of the sclerotic through which the optic bundles pass to the inside of the

eyes, and also to extend as an external coat over the whole of the sclerotic, as far as its anterior margin in front of the lens. The demonstration of the retinal structure was postponed, and Dr. Fripp, indicating the results of his examination, stated that they strongly corroborated the modern explanation of vision by direct transference of impressions of light through a radial system of fibres to the ganglionic layers of the optic nerve, where the conversion of the physical impressions into sensation might take place. Assuming this radial system to be correct, there existed no essential difference of plan or principle between the Mollusc Insect and Vertebrate eye, for the system in greater or less perfection existed in each, though not always recognised as such.

CHEMICAL AND PHOTOGRAPHIC SECTION, MAY 10.—Dr. W. B. Herapath, F.R.S., president in the chair. Mr. W. L. Carpenter made a verbal communication, entitled "Notes on a Soap-bubble." The brilliant colours visible on a soap bubble were one among many illustrations of phenomenon known in optics as the colours of thin plates—the explanation of which, according to the emission theory very imperfect, had been made extremely clear by the undulatory theory of light. Mr. Carpenter enunciated the four chief laws in connexion with them, giving the mathematical formulæ, and describing the experimental proofs. It appeared that the colours were due to the interference of two sets of waves, the incident ray striking upon the film, being reflected partly from its upper and partly from its under surface, and that the colours, which were not visible by homogeneous light, depended entirely upon the thickness of the film, which varied from 1-178000th of an inch to about 1-17800. Many plans had been tried for keeping the colours constant in the soap-bubble, without much success, as they varied on account of the evaporation from the surface; but the author had accidentally noticed that if the bubble were made in a flask containing a warm solution of soap, the application of heat from beneath might be regulated in such a way that the evaporation from the surface of the solution on the under surface of the bubble should exactly compensate for the evaporation from its upper surface; and in this way be had been able to retain a film of the unvarying thickness and constant shade of colour for a long period. The gentleman who had undertaken to provide a photographic subject for the evening having failed to keep his engagement, Dr. Herapath kindly gave the members an account of many novel scientific instruments exhibited at a recent *soirée* of the Royal Society, at which he had been present, amongst which may be mentioned a new printing telegraph, Mr. Sarby's microspectroscope, some very curious photographs on porcelain, and a new mode of giving stereoscopic effects to portraits, &c., by placing a single picture behind a very thick piece of glass, and viewing the whole by transmitted light.

GEOLOGICAL SECTION, MAY 22.—The first geological walk of the season was taken along the left bank of the Avon, in

order to examine the strata laid bare by the exavations in progress for the Portishead Railway. The afternoon was very fine, and the attendance of members and visitors good. At the first cutting, by Rownham, the upper limestone shales, with some siliceous limestone and millstone grit, were examined, after which the well-known coral quarry was visited, and Mr. Stoddart, who, with Mr. Sanders, the president, acted as guide, pointed out his foramenifera bed. Under the buttress of the bridge the first bed of true limestone was noticed, and at the first tunnel many corals, especially Lithostrotion, were met with. It was in this locality that two very rare fossils, L. McCoyanum and Platyschisma Jamesii, had been found on a former occasion. In the next cutting, the president pointed out some good examples of siliceous nodules and crystalline veins in the limestone, after which, passing the great fault in Nightingale-valley, the upper limestone series was observed to occur over again. A littoral bed was pointed out, from which several fossils were obtained, among them Terebratula hastata, an uncommon shell. A quarry on the side of the railway was then visited, noted as the only locality in the neighbourhood for coal plants. Shortly afterwards, some magnificent specimens of Producta gigantea and Euomphalus nodosus were obtained, and when the lower limestone shales were at length reached, many characteristic shells were found, among them a Leptaena and Chonetes hardrensis. The party then left the line of railway, and, after some trouble, succeeded in finding a small bed, known to Mr. Stoddart, which, to a persevering search, yielded some specimens of the latest occurring Trilobite, Phillipsia pustulosa, and also Retzia radialis.

F. ASHMEAD,
S. H. SWAYNE
A. NOBLE, } *Sectional Secretaries.*
J. BARBER,
P.H. YABBICOM,

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

EXCURSION MEETING.

From the Bristol Daily Post of June 21st, 1865.

The first excursion for this season took place on Tuesday week, and was attended by a considerable number of members and lady-visitors. The party left Bristol for Clevedon by the 11.20 a.m. train, and were met on their arrival by the Rev. G. W. Braikenridge, F.L.S., who had kindly undertaken to place his acquaintance with the localities of various interesting objects of Natural History at the disposal of the Society. Availing themselves of a large break and other means of conveyance which had been provided, the party drove first to the old church, situated near a cliff of carboniferous limestone. Here the geologists met with several characteristic fossils, as encrinites, corals, &c. Among the latter may be mentioned Cyathophyllum and Clisiophyllum, some showing the structure very beautifully, while the botanists obtained specimens of several interesting plants, the Bee Orchis, the wild sage, Anthyllis vulneraria, Torilis Authriscus, &c., and also a large number of diatoms, very minute microscopic plants, from the surface of the mud — chiefly Pleurosigma battica. After exploring this locality, the party divided — one portion wishing to explore the Rhines near Clevedon Court, whilst the majority, which included all the botanists, re-entered the conveyances and drove round by the village of Weston-in-Gordano to search for rare and curious plants in the neighbouring woods. Those who visited the Rhines were under the guidance of Mr. Frederick Martin, who on a former occasion made a communication to the society upon the results of his study of the marine zoology of the district, and they were occupied chiefly with the mollusca peculiar to localities of that nature. Specimens of the following were captured:—Bithinia, Pisidium, Planorbis vortex, P. spirorbis, Physa fontinalis, Lymnea peregeretor. On their return to Clevedon, a piece of magnesian limestone, containing lead, copper, and manganese, was obtained. The botanists, under the guidance of the Rev. G. W. Braikenridge, after a long drive in the sun, were grateful for the shelter afforded them by the luxuriant vegetation of Weston Comb. In this beautiful spot several very interesting plants were met with—Lithospermum purpureo-coeruleum, which is a local species of the borage wort, Lathyrus sylvestris, Hypericum montanum, Hypericum Androsœmum, Orchis pyramidalis, Vicia sylvatica, Pyrus Aria, or the Beam-tree, and many other curious and comparatively rare plants. The Butterfly Orchis, which is occasionally found here, was not, however, discovered. Honeysuckles, roses, and other ordinary flowers were growing in the richest profusion, and the common Pteris, or brake fern, was

frequently met with from seven to eight feet high. Leaving this delightful neighbourhood, Mr. Braikenridge took the members across the valley to some meadows in the neighbourhood of Clevedon, in search of an exceedingly rare plant, Ranunculus lingua, with a few specimens of which they were fortunate enough to meet, and they then proceeded to investigate the botanical products of some of the Rhines in the neighbourhood of Clevedon-court. Specimens of the following plants were obtained :—Yellow Iris, Myosotis palustris, M. coespitosa, chara hispida in abundance, the white water lily, in its native habitat, Equisetum limosum, Hippuris, and others. Having spent some time here, the party returned to Clevedon, and rejoined the smaller division of the members who had arrived a considerable time before them at the Royal Hotel, where an exceedingly good dinner had been provided by the landlord, Mr. Jones, which was done ample justice to after the fatigues of the day. At the conclusion of it, the hon. secretary, Mr. A. Leipner rose, and said that it was more in accordance with the custom usually observed at the society's excursions than from any rule on the subject that they abstained from making any speeches, but that this was one of the occasions when it was desirable to depart from that custom, and he called on the President to explain the reason. Mr. W. Sanders, on being thus appealed to, justified the course then taken by observing that when any great benefit had been conferred, the least the recipients could do was to acknowledge it in a suitable manner. It must have been evident, he continued, how much of the pleasure they had all enjoyed during that delightful day was due to the thoughtful and careful arrangements carried out by the gentleman who had so kindly given them the benefit of his great local knowledge, and he therefore felt that he could not do otherwise than propose that the very warm thanks of the society be given to Rev. G. W. Braikenridge for his kindness that day.

Mr. Braikenridge, in briefly responding, expressed his regret that the society had not been able to take the excursion a week or two earlier, when other plants would have been in blossom.

The members shortly afterwards returned to Bristol by the 8.20 p.m. train, agreeing that the day they had thus spent was one of the most agreeable and successful excursions ever taken by the society.

WM. LANT CARPENTER,

Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

SECTIONAL MEETINGS.

From the Bristol Daily Post *of August 2nd*, 1865.

Botanical Section, June 9th.—By the permission of Sir William Miles, the members, with several friends, met the president, Mr. Leipner, at the Suspension-bridge, for the purpose of investigating Leigh Woods. Proceeding to the top of Nightingale Valley, the open ground appeared carpeted with a profusion of the bright flowers of Helianthemum vulgare, interspersed with patches of Erica Tetralix and Thymus Serpyllum. Veronica officinalis was plentiful, as also Potentilla Tormentilla and Galium sexatile. Proceeding through the woods by the path skirting the top of the rocks, but few plants of interest were found in flower, the most worthy of notice beingTamus communis and Bunuim flexuosum, also the bright little Lysimachia nemorum, and Daphne laureola was seen in fruit; among the Filices was Blechnum boreale. The party at length arrived at the marshy ground lower down the river. Here was found a solitary late flower of the beautiful Menyanthes trifoliata, while the scarcely less handsome Viburnum opulus was more abundant. The Orchidaceæ were represented by some fine spikes of Listera ovata and Orchis maculatum. In the more marshy part of the ground Equisetum palustre was found in fruit, and in the valley were the handsome fronds of Lastrea Filix-mas, and less commonly L. spinulosa. Asplenium trichomanes and Ceterach officinarum were growing plentifully in an old wall. Passing down the valley the party arrived at the river side, returning by the towing-path. Glaux maritima was very plentiful upon the mud, and a few plants of asparagus officinalis were seen. Lithospermum arvense, Galium cruciatum, and Reseda luteola were also found, and the abundance of Conium maculatum in one spot was noticed, though scarcely yet in flower.

Botanical Section, June 23.—On this occasion the members of the section accompanied their President, Mr. Leipner, on the Port Railway as far as Shirehampton, the object being to explore the Prior's Wood, near Portbury. Crossing the river, the party proceeded through Pill and St. George's to Portbury, finding in the fields and lanes through which they passed many plants of interest. In one place a species of the singular genus Orabanche was found in great abundance, parasitic upon the roots of Trifolium repens, and Papaver Rhæas and Anthemis nobilis made the ground brilliant with their showy flowers. After passing Portbury, the party entered a lane leading to the wood, which presented at every turn scenes of sylvan beauty much resembling the lanes of Devonshire; the high banks on either side covered with luxuriant vege-

tation and crowned with hedges of Rosa and Rubus, presented much to interest the members, among which were found in flower Stachy's sylvatica, Melamphyrum pratense, and Hypericum quadrangalum ; the fronds of Lastrea filix-mas showing conspicuously in company with Polystichum acullatum, while the climbers, including some species of the Rubiaceæ, Tamus communis, Bryonia divica, and the delicate Convolvulous sepium clothed the thorns with a delicate network. In the wood was noticed a considerable quantity of Vaccinum myrtillus, Betonica officinalis, and Digitalis purpurea, and in one little marshy spot Chrysosplenium oppositifolium. Here also the ferns attained a great luxuriance, the most conspicuous being Athyrium filix fœmina, Polystichum aculeatum, Lastrea dilitata and Scolopendrium vulgare, and less commonly Blecknum boreale.

Entomological Section, May 23.—Several members went to Brockley Combe, but, in consequence of the rain, were not successful in capturing any but the most ordinary species of insects.

June 29.—An excursion had been arranged to Nailsea marshes, but was postponed on account of the unfavourable state of the weather.

July 18.—An evening meeting was held at the Philosophical Institution, Mr. S. Barton, president, occupying the chair. The Honorary Secretary, Mr. John Barber, having tendered his resignation, and explained his reasons for doing so, it was accepted, and Mr. Geo. Harding, jun., was elected to fill the office for the remainder of the year. It was agreed to make another attempt to explore the Nailsea marshes on Saturday, July 29. Mr. A. E. Hudd exhibited larva of Acidalia Holosericeata. Several members mentioned the great abundance of Macroglossa Stellatarum this season. Mr. John Bolt exhibited a fine specimen of Geometra Papilionaria taken in the Gully, Durdham-down, this season.

July 29.—Several members visited the marshes near Nailsea, but owing to the high wind prevailing during the afternoon very few captures of imago were made, and none calling for special reference. A few larvæ were taken, including Bombyx Quercus, Smerinthus Ocellatus, and Depressaria Ocellana.

T. H. YABRICOM, } *Sectional Secretaries.*
GEO. HARDING, Jun., }

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

EXCURSION MEETING.

From the BRISTOL DAILY POST *of September* 1st, 1865.

The second excursion of this Society for the present season took place on Tuesday last, 29th inst., the locality chosen being Cheddar. About forty of the members and their friends availed themselves of the opportunity of visiting that delightful and interesting place. The party was conveyed in two large breaks, furnished by Mr. Wakeham, of King's Square, and the manner in which his horses performed their work gave great satisfaction. The route taken was over the Suspension-bridge, through Bourton, Backwell and Brockley, to Cleeve, where a brief halt was made, and thence through Congresbury and Dolbury. As many of the party walked up Church Hill, the President, Mr. W. Sanders, F.R.S., called their attention to the strata of limestone on the right hand side of the road, in which were imbedded a large number of flints. He stated that the occurrence of flints in chalk was probably familiar to almost every one, as also the fact that those flints were originally sponges and other low forms of animal life which had become silicified by withdrawing the silex from its solution in the water of the sea, at whose bottom the carbonate of lime was deposited. It was not, he said, so common to find flints, such as these, which were formed in precisely the same way as the chalk-flints in mountain limestone; there were, however, other instances on the South flank of the Mendips. Mr. Sanders also pointed out the well-defined stratification on the hill upon which Dolbury Camp is situated, and said that though up to this point the "dip" (or inclination downwards into the earth) of the beds had been towards the North, it would henceforward be in the opposite direction, towards the South. On the road towards Shipham, a field was noticed with a large quantity of Colchicum-autumnale, or Meadow Saffron, and near here also the botanists of the party met with a few other somewhat uncommon plants. At the top of the hill, whence a very magnificent view of the Bristol Channel and the surrounding country was obtained, it was noticed that the crest of the Mendips had been reached, where the lowest strata came "up to clay," and as an evidence that the top of the great anticlinal had been passed, some Old Red Sandstone with a Southerly dip was pointed out. The general formation of the surrounding hills was briefly touched upon, the deposition of the Carboniferous limestone on the outer surface of the hills, and New Red Sandstone in the valleys, being explained.

After arriving at Cheddar, the members dispersed to enjoy the beautiful scenery, and to follow out their special pursuits. A large number remained with the president, who kindly explained in full, and practically illustrated, the method of ascertaining the altitudes of various stations above the sea, by means of the Mountain Barometer. The principle of the process consisted in estimating precisely the pressure of the air at each station, as indicated by the height of the mercurial column, and, as the pressure varied inversely as the height, being less at greater elevations, the desired information could be deduced when this was known. Though thus simple in principle, a trustworthy result required the observance of a great number of minute precautions, as well as a repetition of the observations. When the visible length of the mercury column had been obtained with the greatest accuracy, it was necessary

to make several corrections for temperature, diurnal variation, &c. In the experiment made, the reading at the lower station was 30 124 inches, and at the upper 29 668, showing a difference of level equivalent to 399 feet. Several aneroid barometers were compared at the same time, one of them giving a result which only differed by six feet from the above. During a walk up the Cliff-road, Mr. Sanders gave a brief explanation of the geological features of the cliffs. He said that the various theories put forth to account for these great fissures might be divided into two classes. The first and most probable supposed that the fracture had commenced during the upheaval of the rocks from below, for, consisting of carboniferous limestone themselves, they had been under water during the whole time of the deposition of the New Red Sandstone. If a gradual elevation, such as is now going on in Sweden, took place during this period, any crack or fissure would be enlarged by the action of the waves, and thus a large chasm formed, if sufficient time were allowed. The other theory had been put forth by Professor J. B. Jukes, and supported by Professor Ramsay, and attributed these chasms—of which the valley of the Avon was another example—to the slow action of little rills of fresh water, wearing down the valley, after the whole of the rocks had been upheaved from the sea-bottom. Mr. Sanders then adverted to the total absence in this ravine of such evidences of glaciers as were seen in Snowdonia and Cumberland, and said he was disposed to infer that during the Glacial epoch there were no glaciers in the South of England. On returning to the Inn, several interesting plants were met with, including the yellow poppy or Meconopsis Cambrica, Polypodium calcareum, &c. Dinner was served in the garden of the inn, after which Mr. Cox took the party in detachments to see the interior of the famous caverns, which, by the kindness of Mr. Stoddart, were illuminated with the magnesium light. The effect of this was very wonderful, the stalactites standing out with marvellous distinctness, and the rich drapery of the roof being visible over a large extent of surface, leaving an impression which will not soon be forgotten, and which imagination can scarcely picture. The setting sun, however, warned the members that the pleasantest days must end, and they therefore returned to Bristol by way of Axbridge, Cross, Redhill, and Barrow, after a most interesting and delightful excursion, the enjoyment of which was heightened by the great clearness and mildness of the atmosphere.

SECTIONAL MEETINGS—BOTANICAL SECTION, AUG. 8TH. —Several members of the section took advantage of the Fairy Queen to explore the neighbourhood of Portishead. The evening was fine, but the time allowed very limited. Under the battery point the underwood yielded Galeopsis Tetrahit, Vicia cracca, and Hypericum perforatum. The land skirting the sea shore had several specimens of Erythæa centaurium, whose pretty rose-coloured flowers were closed, except in sunshine, Eupatorium cannabinum, and Teucrium Scorodonia. On the marshy ground Althæa officinalis, or marsh mallow, was met with, and near the rhines Alisma plantago, Myosotis cœspitosa, Ranunculus Flaminula and R. Sceleratus, Samolus valerandi, and Helosciadium nodiflorum, often mistaken for watercresses. Some interesting microscopic plants and animals were also captured in the rhines.

Aug. 18.—On the evening of this day the members of the section were most hospitably entertained by Mr. Wm. Tanner, at his house, Ashley Farm, Horfield. The object of the meeting was to inspect his valuable and interesting collection of ferns, both living and dried. The living ferns, comprising plants from all parts of England and Wales, Madeira, Italy, New Zealand, and other parts of the world, were seen growing to very great advantage in a canvas house, the more delicate ones being removed to a vinery in winter. Many plants, however, had been trained gradually to become hardy, and would now endure a much lower temperature than at first. In some species the departure from the fern type was very great, both in general appearance and mode of growth. In addition to the ferns, Mr. Tanner's house contained many other objects of interest, and a most agreeable and instructive evening was spent.

Entomological Section, Aug. 15.—An excursion that was to have taken place to Brean Down was postponed in consequence of bad weather.

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

EXCURSION MEETING.

From the Bristol Daily Post *of September 20th,* 1865.

The last excursion for the season took place on Friday last, the 15th inst., and was devoted to examining the quarries of the inferior oolite at Dundry. The members were conveyed in a break furnished by Mr. Butson, which called for them at various parts of the city, and proceeded through Bedminster. After passing Bedminster turnpike, the road ascends towards the lias quarries on the Down. On the way, the president, Mr. W. Sanders, F.R.S., pointed out the junction beds of the new red sandstone with the lias, and Mr. W. W. Stoddart called attention to, and distributed specimens of, an interesting bed of limestone which occurs here, and is remarkable for the abundance of a water plant called Naiadites petiolata, and little bi-valve Estheriæ. The road then continues over lias strata through the village of Bishport, and at the foot of Dundry-hill the party left the carriage in order to walk up the fields adjoining the road. Here Mr. Sanders explained that this field was composed of the upper third part of the lias, and that at the upper end were traces of the Marlstone beds, which, with the upper lias sands, were very thin and difficult to be recognised. On entering the road again at a sharp bend, the lowest beds of the inferior oolite were shown, and after ascending a little farther, the roadside quarries, named, for this occasion, "Cross-roads quarry," were reached and well "worked." Many interesting and characteristic fossils were obtained, including several species of Ammonites and Belemnites, Rhynchonella spinosa, Nautilus lineatus, N. truncatus, Pecten barbatus, Modiola Sowerbyi, Trigonia costata, two species of Opis, Astarte, Lima proboscidea, and last, though not of least importance, a portion of a claw of the crustacean Glyphaea rostrata. Having satisfied their geological desires, the party proceeded to the church, and stopped to admire the noble tower, and to notice the fine condition of its several parts—the buttresses, string-courses, window-mullions, &c., after enduring the storms of four centuries. Near here was seen the quarry containing beds of splendid building stone, equal, if not superior, to the Bath freestone. Being unfossiliferous, however, it did not call for a long visit, and the party proceeded to the escarpments on the western margin of the hill, and the so-called Yew-tree quarry. Here every hammer was soon at work, and many fossils collected, including, in addition to abundance of Ammonites, Trigonias, &c., Cliona, Lima Etheridgii, Modiola crassa, Mytilus, as well as some of those species which were found at the first quarry visited. The summit of the down was then reached, and the members loitered to indulge in the glorious panorama visible from this point, which, owing to the clearness of the air, was more than usually extensive, reaching to the White Horse, near Westbury. Mr. Sanders

stated that previous barometric observations enabled him to state the height at about 769 feet, and Mr. Stoddart's aneroid gave the elevation above Redcliff-street as 750 feet. Proceeding towards Chew Magna, quarries on the south side of Dundry-hill were visited, very similar in character to the others, and which yielded, besides the usual conchifera, a good specimen of a spine of Holectypus depressus (Echinus). Pleuromya elongata, P. tenuistriata, Gresslya abducta, &c. Here, also, was the coral bed, affording good specimens of Isastræa explanata. On descending the road, the lias strata soon came into view, and a steep part of the road, near Chew Magna, displayed the junction of these beds, with the red marls of the new red sandstone. It was pointed out that there was an inclination of as much as 2° (or two degrees), towards Bristol in the whole of the strata, and that, in all probability, a disturbance had taken place subsequent to the deposition of the Oolite. At the Pelican Inn, good provision had been made for the party by Mr. Smith, to which ample justice was done, after the special object of the excursion had been attained, and the party was here joined by Mr. John Colthurst, who kindly obtained access for them to Chew Magna church. After spending some time in the examination of this beautiful piece of architecture, the members were most hospitably entertained with coffee and the "social cider-cup" by Mr. Colthurst, at his private residence, after which the break was again entered, and a most delightful and successful excursion agreeably concluded by a drive back to Bristol through Stanton Drew and Whitchurch.

Entomological Section, Sep. 9th.—Excursion meeting. Fortunately the weather, which on several previous occasions had been singularly adverse, was sufficiently favourable to render this excursion most agreeable, and, considering the lateness of the season, successful. Clevedon was the locality selected, and reached by the 1.45 p.m. train. Most of the Lepidoptera (butterflies, &c.), were found in a more or less worn condition, and consequently many specimens were allowed to regain their liberty after capture. Several species of Crambites, Pyralides, Geometrac, and Pterophori were taken, as well as a few specimens of Coleoptera. A number of the pretty but common Anaitis Plagiata were observed sitting on the rocks, and a fine specimen of Abrostola Urticæ was captured, flying in broad daylight round the flowers of the Clematis, which elicited the remark from one of the members that it was a most unusual occurrence for that species to be on the wing during the day.

WM. LANT CARPENTER,

Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

From the Bristol Daily Post *of October 9th*, 1865.

The evening meetings of this society having been lately resumed, the first general monthly meeting for this session took place on Thursday last, October 5th, at the Philosophical Institution, and was attended by a considerable number of members and friends, amongst whom we noticed several ladies.

Mr. W. Sanders, F.R.S., F.G.S., the much-respected President of the Society, occupied the chair, and in opening the proceedings referred to the excursion meetings of the society and of its sections which had taken place since the spring. He hoped that this session would be as successful as the last, and it would be so if everyone would do his share. The council were not, as yet, well provided with papers, and he called upon the younger members to promote the society, not merely by their presence, but by their contributions of papers or short notes (which could be put into shape by the secretaries) on those branches of science to which they devoted themselves. Mr. Sanders then alluded to the loss the society had sustained in the death of a gentleman who was known to a wide circle of acquaintance, and who, in addition to rendering valuable aid in its formation, had presided at the inaugural meeting, and filled the post of vice-president of the society for the first year. He referred to the Rev. Canon Guthrie, whose death they would all lament, as also that of Mr. C. G. Heaven, who for a long period had been attached to the various societies connected with the institution.

The hon. secretary, Mr. A. Leipner, announced the election of three new members, Mr. C. E. Wright, Mr. E. Brightman, and Mr. C. Desprez. He then stated that the desirability of holding a soirée during the winter had been discussed by the Council, who wished to have the opinion of the members also. It was proposed to illustrate it with, as far as possible, local specimens of natural history and objects of general scientific interest. A favourable reception was given to the project, and the Council was requested to make inquiries and provisional arrangements, subject to confirmation at the November meeting.

Mr. Hugh Owen, who had kindly come from London to attend this meeting, then read two short papers of great interest. The first was a description of the habits of the Perioptbalmus Papilio—literally, the "look-all-round butterfly fish," which spent the greater part of its life out of the water. It belonged to the Goby family, and was tolerably numerous in the river Gambia, on the West Coast of Africa, where it was frequently seen lying with its mouth above the water, or hopping along the surface of the mud in the mangrove swamps. Its eyes were so placed that it could examine its own tail with the greatest facility, and its great activity enabled it readily to seize any insect behind it as well as in front, and also to escape from its pursuers. From these two causes its capture was a very difficult matter; only six specimens had reached the author, and one of these he presented to the society. If it were prevented from returning to the water this curious little fish, which seldom exceeded six inches in length, would bound up the mangrove trees. One very striking peculiarity was the great size of the otolith, the malleus being larger than in fishes a hundred times its size.

The second communication was upon the instability of colour in certain feathers. Dr. Benjamin Hinde, a son-in-law of the author, had sent a pair of plantain eaters—

Musophaga violacea—from the Gambia to Ireland, where the splendid crimson of their plumage soon faded to a dull gray, though the birds appeared healthy. A third specimen was obtained with the same result. Some feathers from another bird of the same species were then sent to England, but Mr. Owen had been unabled to alter the colour, even by strong chemical re-agents; his correspondent, however, stated that if a feather was washed in hot water soon after its removal from the bird the colour disappeared, while a trace of soap caused it to leave the feather immediately, staining the fingers, the water, or paper. Specimens of feathers and paper so treated were exhibited. The colour appeared to be pigmentaceous and soluble—not pulverulent. Mr. Owen believed that this fact had never been published before. He also took the opportunity of correcting two inaccuracies in the published accounts of this species—first, it was capable of reversing the outer toe, and further, that two varieties existed, one with and one without a white strip under the eye.

Some conversation took place on the subject of this paper, and Mr. Groome Napier called attention to the disappearance of the colour from many birds' eggs, especially when freshly blown. An instance was mentioned of a blue parrot turning gray in confinement. A vote of thanks having been passed to Mr. Owen,

Mr. C. O. Groome Napier, F.G.S., read a paper on the food and attractive qualities of birds, extracted from his work entitled "The food, use, and beauty of British Birds," which is in course of publication by Messrs. Kerslake and Co., of Bristol, and Groombridge and Sons, of London. He also exhibited a synoptical table, which gave at one view, and in a manner easy for reference, the results of a long series of researches upon the contents of birds' stomachs at different periods of the year, together with notes on their habits, &c., all of which will be found in the volume referred to. At the conclusion of the reading, the President spoke of the value of the immense mass of information which Mr. Napier had collected, and remarked that as the paper was already printed, it was scarcely fair to the author to invite discussion.

Mr. Thomas Grundy exhibited some silkworms from a second hatch this year. They were about two months old, and the eggs from which they came were laid a month previous to that time. This was the only instance known to the members present of a second brood being raised in one year. Mr. Grundy also showed a good specimen of the Euonymus, or spindle-tree, from Durdham-down, not generally noticed there.

Mr. W. W. Stoddart showed specimens of the freshwater cray-fish, Astacus fluviatilis, living and dead, taken in the river Windrush, near Witney, Oxfordshire. Mr. Leipner remarked that they were very abundant in nearly all mountain streams abroad, and reached a much greater size than these, though they were the same species.

In closing the meeting, the president drew attention to the discussion promoted by the specimens shown that evening, and expressed the hope that all members would follow the example thus set, of providing subjects of interest for the meetings.

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

From the Bristol Daily Post *of October 17th,* 1865.

SECTIONAL MEETINGS.

Geological Section, Sept. 29.—Several members and visitors met for the last geological walk of the season at the Bristol terminus, and, after a pleasant drive to Whitchurch, walked over a portion of the North Somerset Railway, by the kind permission of the contractor. Mr. W. Sanders, F.R.S., president, pointed out the junction of the Coal measures with the New Red Sandstone, and also the junction of the latter with the Lias. The railway cuttings in this neighbourhood are principally in the Lias, the limestone beds of which are unusually fine and of great thickness, especially in the division of the series known as the White Lias. The members were successful in obtaining a large number of fossils, some of which were quite new to the district. The most worthy of notice were a specimen of Ammon semisulcatus, not often figured, Am. Conybeari, Am. Bucklandi, Lima gigantea. Modiola, two fine Pectens, Rhynchonella, two species of Terebratula, and also of Cerithium, Ostrea, Cardinia, spines of Hemipedina, scales of Pholidophorus, and two species of coral, resembling Lithostrotion or Syringophora. Several gigantic Septaria were seen *in situ.* After spending a pleasant afternoon in the examination of these interesting fossils, the members returned *viâ* Whitchurch to Bristol.

Botanical Section, Oct. 3.—The last walk of the season was devoted to an examination of the neighbourhood of the lower part of the river Trym. The members met their President. Mr. Leipner, on Durdham-down, and proceeded on the Kingsweston road as far as Mill-pill-bridge, when the party descended to the banks of the stream, which was very low from the continuance of dry weather. The Nasturtium officinale was observed growing here as well as some other aquatic plants, and the patches of Oscillatoria on the banks resembled cushions of dark green velvet. In the copse below the bridge a few common ferns, as Polypodium, Scolopendrium, and Filix-mas, were noticed, much withered for want of water; and the very forward condition of the next year's leaf-buds on many trees attracted much attention. A little lower were seen the plants of Cochlearia officinalis, and in the stream generally some fine species of Confervoid Algæ. Aster trifolium, Plantago maritima, and Spergularia maritima were growing near the banks, and under the bridge at Sea Mills a quantity of Enteromorpha intestinalis. The river yielded a large number of the microscopic organisms known as Diatoms, those free on the mud being chiefly Nitzschia tænia, Pinnularia viridis, and Navicula tumens, while among the algæ were found Nitzschia angularis, Diatoma elongans, a species of Pleurosigma, and more rarely Suricella striatula. Near the confluence of the Avon and Trym were seen Papaver Rhæas and Anthenus nobilis. A fine plant of Conium maculatum was found, and an abundance of Polygonum aviculare and Atriplex patula. A few stunted specimens of Knautia, Senecio, and others were met with, but the flowering plants generally were in a very dry condition.

ENTOMOLOGICAL SECTION, OCTOBER 10TH—First evening meeting this session. Mr. S. Barton, president, occupied the chair, and there was a good attendance of members. After the reading of the minutes of the excursion meetings, Mr. W. L. Carpenter mentioned the desirability of noting the occurrence of every species, however common, with a view to ultimate publication in the Society's work on the Natural History of the district. The secretary, Mr. Harding, called upon members to furnish papers for the evening meetings, and by way of setting the example, read a short note on the occurrence of a species of Eupithecia, new to this district. In 1862 he had captured a worn specimen of this genus, with which he was unacquainted, and could not identify its species; in 1863 and 1864, he had searched for it unsuccessfully, but two specimens were shown to the section in 1864, which he believed to be of the same species as his capture. These had been taken near London, by Dr. Knaggs, and named E. lariceata. In June of this year, between the 6th and 20th, Mr. Harding had taken at Brockley a few specimens, on or near larch trees, on which the larvæ fed. He exhibited these, and also a fine specimen of Acherontia Atropos, or death's head moth, bred this year. Mr. A. E. Hudd showed Lycæna Loreyi and L. Adonis, a foreign species. Mr. Bolt brought a fine series of insects, which might be captured in ivy during the present month, including Dasycampa rubiginea, Xanthia Aurago, Xylina semibrunnea, X. petrificata, and Heliothis armigera, rarely found, a collection which was the result of several years' work. Mr. Jacques mentioned a remarkable instance of a white cabbage butterfly larva, which did not spin silk as a rule, climbing a smooth vertical sheet of glass by the aid of this excretion, produced for that purpose.

CHEMICAL AND PHOTOGRAPHIC SECTION, OCTOBER 11TH.—Dr. Herapath, F.R.S., president, in the chair. The secretary, Mr. Noble, stated that at the meeting summoned for September 13th, and then postponed to the 20th, so few members attended that no business was done. He was glad to see so large an attendance that evening, and hoped that as thirty gentlemen belonged to the section, as many as possible would make an effort to attend. The Rev. W. Whiting, M.A. then brought forward some illustrations of the phenomena of polarised light, shown by Goddard's new form of polariscope, made by Highley, of London. The light from an oxyhydrogen lime-light, enclosed in a lantern, fell upon a bundle of glass plates at an angle of 56° 45′, and, reflected thence in a polarised condition, passed through the crystal, or other substance to be examined, then through several lenses, and finally through a Nicol's prism, two inches in length, called the analyser, after which it fell upon a white screen, where the phenomena were visible to a large audience, instead of only to one person at a time. In giving a brief explanation of the cause of the remarkable colours brought out, Mr. Whiting insisted strongly on the axiom that the index of refraction was the tangent of the polarising angle of any substance, and hence that the reflected and refracted ray were at right angles to each other. After some interesting experiments with tourmalines, some curious specimens of unannealed glass were submitted to the instrument, and very remarkable lines and bands rendered visible in it. Many sections of crystals were examined, showing the crosses, coloured rings, &c., characteristic of each, and which were invisible with ordinary light. Some of the most beautiful objects were designs in different thicknesses of selenite, which changed their colour during the rotation of the analyser—green fruit, for example, becoming apparently ripe, and a chameleon changing its hue constantly. Mr. Whiting, who was assisted both in the experiments and explanation by the president, stated that, as far as one trial enabled him to judge, the polarisation of light did not affect its actinism or power of acting on chemical substances for photographic purposes.

Zoological Section, October 12. — First evening meeting of the session; Mr. A. Leipner presided. It was proposed by Mr. E. A. Praeger, and resolved, that the meetings of this section should henceforward take place on the second Thursday, instead of the first Wednesday, in each month. The president, Dr. Henry Fripp, continued his account of the structure of the eye in the cuttlefish, which he illustrated with a number of very beautiful microscopic preparations. Referring to his former paper, read in May last, he pointed out the difference between the collective eye, where the visual subject was concentrated at one point, as in the eye of all Mammals, and the insect eye, which contained a great number of facets, each with its lens, nerve fibre, &c., and stated that though they were generally considered to differ in absolute speciality, he wished to show that they were really only types diverging in detail, and that the Cephalopod eye, hitherto little understood, was to be regarded as a sort of connecting link between the two. The analogy was to be traced through a radiary system or arrangement of nerves, which had long been known in the insect eye, but only recently discovered, and even now not readily understood in the human eye. In this wonderful instrument, the picture formed by the lenses and humours was generally supposed to be on the retina, but it really was on the choroid coat, the ends of the mass of nerve fibres forming the retina, turning back at intervals, so that their terminations, resembling the pile of velvet, were placed radially at right angles to the " camera picture" on the curved inner surface of the coats of the eye. The fibres thus turned back had several rows of ganglia, but, eventually, towards their termination, became changed from nerve fibre to connective tissue, and were hence at first supposed to belong to a tactile organ—so closely were the senses of sight and touch connected. In the Cephalopod eye it was unexplained why the retina was separated from the crystalline lens by a layer of black pigment, quite impervious to light; but Dr. Fripp demonstrated that this black pigment contained a radiary arrangement of nerve fibres, similar to that existing in the insect eye, which connected the posterior and anterior retinæ, and through which the visual sensation, caused by the picture thrown by the single lens upon the membrane immediately in front of the pigment, passed, and excited a corresponding impression on the retinal expansion of the optic nerve.

F. ASHMEAD,
T. H. YABBICOM,
G. HARDING, Junr., } *Sectional Secretaries.*
A. NOBLE,
S. H. SWAYNE,

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

From the Bristol Daily Post *of November 6th*, 1865.

The usual monthly general meeting was held on Thursday evening last, at the Philosophical Institution, under the presidency of Mr. W. Sanders, F.R.S., and, probably from the inclemency of the weather, was not very numerously attended. After reading the minutes of the previous meeting, the honorary secretary, Mr. A. Leipner, made a statement of the probable expenses and arrangements for the proposed soirée, which gave rise to some discussion, and it was eventually agreed that the consideration should be postponed until next season, with the view of ascertaining more definitely the amount of support which would be given to the scheme by the members generally.

Mr. Charles Ravis read a very excellent paper on two raised beaches at Weston-super-Mare, illustrated with good drawings of the locality and geological specimens. After describing the carboniferous limestone promontory, of which Swallow Cliff forms the termination, the author said that, ascending the hill from the end of Sand Bay, and following the direction of a wall which ran diagonally across the promontory, a point was reached on the opposite side, overlooking at a height of 20 or 30 feet a small bay with a pebbly beach, strewn with conglomerate boulders, much water-worn, which were masses of an ancient sea beach fallen from the face of the cliff, where similar masses might be seen *in situ.* The upper portion of this ancient beach was composed of loose friable matter, containing sand, pebbles, shell fragments, &c., partly held together by the roots of the turf growing on the top of the cliff. The whole beach was three or four feet in thickness and lay horizontally, and therefore unconformably, upon the limestone strata. Its extent inland had not been determined. After some remarks on the subject of raised beaches generally, as indicating an upward movement of the land taking place during the present period of geologic time, Mr. Ravis pointed out the occurrence of a large mass of trap rock almost perpendicularly under the limestone strata immediately supporting the raised beach, and described the effect of the protrusion of this igneous rock upon the limestone at the point of contact of the two. The author then stated the results of his search on the south side and more elevated parts of the hill, where, underneath the turf, a stone was turned up, apparently *in situ*, which had very many of the characteristics of a portion of beach, specimens of which were shown, and he also indicated the possible existence of an extensive raised beach, at a high level, unconnected with local igneous action. The second locality described was Birnbeck Cove, where a trap dyke was seen stretching across the beach from the limestone cliffs to low-water mark, and where, again associated with igneous rock, what was probably a raised beach might be seen in the face of the cliff, immediately under the turf. Very few shells were discoverable in the conglomerate, but numerous fragments of bones of comparatively recent mammals were found, which must have been mixed up with the sand and pebbles while still subject to the action of the sea. Above this, on the other side of the road, was a bed of sand similar to those formed by the action of the wind near flat recent sea beaches, and another deposit, at about the same height, occurred at Brean Down. Mr. Ravis concluded his paper by pointing out that the occurrence of these sandy and pebbly deposits at about the same height seemed to indicate a general rising of the land along the entire coast, occasioned probably by plutonic action.

BRISTOL NATURALISTS' SOCIETY.

SECTIONAL MEETINGS.

From the BRISTOL DAILY POST *of November 16th,* 1865.

BOTANICAL SECTION, OCT. 19.—Mr. A. Leipner, president, in the chair. The honorary secretary brought forward, for the approval of the members, a system for more effectually working the study of Botany during the winter months, proposing that at each meeting a subject should be named, to be discussed at the following one, to enable each member in the meantime to collect such materials as he could, whether in the shape of communication, drawing, or only actual specimens. The plan was favourably received, and the president suggested as subjects suited for such combined working the various kinds of starch, the functions and forms of stomata, the occurrence of Raphides in the tissues of plants, the markings on woody fibre, the position of the medullary rays, &c. It was agreed that the subject of Starch should occupy the next evening, and several members undertook to investigate the structure of particular plants. A section of the stem of Pinus sylvestris was shown, exhibiting the production of a young branch from the parent stalk, and consequent displacement of the surrounding wood. It was stated that the manner in which the woody fibre of the branch joined that of the stem had not yet been made out, and would be a suitable subject for close investigation.

GEOLOGICAL SECTION, OCT. 26.—Mr. W. Sanders, F.R.S., president, in the chair. Mr. A. Leipner brought forward some new views on the arrangement of some species of corals belonging to the Devonian period. Mr. W. W. Stoddart, F.G.S., exhibited a set of fossil otoliths which he had collected from the Tertiary beds of Hampshire and Sussex. After a short description of their different shapes and characters, the true position and office in the animal of these curious concretions were shown by the dissection of some fishes' heads. The author observed that there were six of these otoliths in the head of every fish, and mentioned the remarkable circumstance that the otolith of some of the cartilaginous fishes, as the sturgeon, was of stone-like hardness. After calling attention to the exquisite structure of the hearing apparatus of fishes, and its intimate connexion with the brain, the author gave it as his opinion that otoliths were deposited by a dialytic process, a thin section showing layer upon layer, in strict accordance with such an origin.

CHEMICAL AND PHOTOGRAPHIC SECTION, NOV. 8.—Dr. W. B. Herapath, F.R.S., president, in the chair.—Mr. Rogers exhibited a deal board which had been exposed to wind and weather for seven months with a printed bill pasted upon it, and the surface of the wood of which had been so acted upon that when the paper was removed an impression of the bill remained, which could not be effaced. As an example of a similar kind of surface action it was mentioned that many glass plates, once used in the collodion process, had permanent images left upon them, which could not be cleaned off by the most powerful detergents. Mr. John Beattie made a verbal communication upon the results of his experience with lenses and in developing. After speaking of the desirability of lenses of large angular aperture for landscape photography, and referring to Sutton's fluid lens, the Pantascopic camera, and other devices for attaining the desired result, he described Harris's globe lens, of 2½ in. focal length, with which good pictures of near objects at wide angles could be taken, and also the triplets by Ross and Dallmeyer, which gave an

angle of 65°, as much as any painter would represent on canvas, alluding lastly to Ross's doublet and Grubb's aplanatic lenses, which had great penetration. As the lens best adapted for all kinds of work, he recommended Ross's triplet. The latter part of Mr. Beattie's address contained an account of the various agents which had been tried and employed to retard the action of the iron developer now used for pictures taken with bromo-iodised collodion, such as gelatine, glycosine, honey, &c., and he concluded by speaking of the so-called instantaneous photography, in

which no new or secret processes were employed, a good developer, a nearly new bath, and rapid exposure being all that were necessary.

Zoological Section, Nov. 9.—Mr. E. A. Praeger in the chair. Mr. W. W. Stoddart exhibited his unique collection of otoliths of recent fishes, the study of which had, he said, demonstrated the fact of a form being peculiar to the species and not to the genus. He briefly described the comparative anatomy of the auditory organ in various groups of animals, commencing with the Rhizostoma, pointing out, as the essential part, a cavity filled with fluid, and containing a solid body vibrating inside of greater specific gravity than the fluid. Mr. Stoddart then dissected the head of a hake, and showed the otoliths *in situ*, saying that he considered them as the analogues of the malleus, incus, and stapes in the human ear. The president, Dr. H. Fripp, after paying a tribute to the unwearied industry displayed by Mr. Stoddart, drew attention to the difference between homologues and analogues, pointing out that many things which seemed to perform the same office were not necessarily the same in anatomical function. Histologically, a bone was a bone, and he objected to that term being applied to these otoliths, which had no organic structure, although they represented an early stage in the histology of bone. Mr. T. G. Ponton exhibited two species of slugs, which had not hitherto been taken in this neighbourhood, Arion hortensis and Limax Sowerbyi, and read Forbes and Hanley's description of them. Mr. Groome Napier exhibited an enormous duck's egg, 4½ inches long, and 7½ inches in circumference, which contained, besides its own white and yoke, another complete egg, also perfect in all respects. It was considered that the phenomenon arose from the accidental enclosure of two germinal spots in one germinal membrane. Mr. W. L. Carpenter read an extract from a Brazilian paper, relative to the recent discovery by Professor Agassiy of many new species of fish in the Amazon.

Entomological Section, Nov. 14.—Mr. Barton, president, in the chair. The president read a paper on two species of Cenatorhina, a genus of the Goliath beetles, found in West Africa. In 1773 Drury had described and figured a species under the name of Scarabeus Micans, and shortly afterwards specimens, very similar, found their way to many European cabinets under this name. Recently, however, specimens had been sent to the author which were pronounced by eminent authorities to be the real Sc. micans of

Drury, a very rare insect, while the other comparatively common species was really Ceratorhina cavifrons. Mr. Barton exhibited male specimens of each, and pointed out the distinctive characters, which he considered as specific, and also showed specimens of two varieties of Dynastes centaurus. Mr. Bourton exhibited several very beautiful West African beetles. Mr. Barber exhibited 27 out of the 40 existing species of myrmecophilus coleoptera, small insects found in or near ants' nests, and also Hypilus quercinus, a very rare insect, taken in Leigh-woods. Mr. Hudd sent for exhibition a series of Eupithecia campanulata, found at Tring, since at Exeter: the larva fed on Campanula trachelium. He also showed the larva of Botys asinalis, from the second brood, which fed on madder. Mr. Harding mentioned the probable occurrence near Bristol of many species of Eupithecia, as their food plants grew in the neighbourhood.

T. H. YABBICOM,
F. ASHMEAD,
A. NOBLE,
S. H. SWAYNE,
G. HARDING, JUNR.,
Sectional Secretaries.

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

From the BRISTOL DAILY POST *of December* 11*th*, 1865.

The usual monthly meeting, which was held at the Philosophical Institution on Thursday evening last, Dec. 7th, was well attended by the members, several visitors also, both ladies and gentlemen, showing their interest in the society's proceedings by their presence. Mr. W. Sanders, F.R.S., president, having taken the chair, called attention to the large number of valuable books on the table, which formed the nucleus of the society's library, and after pointing out that some were donations and others obtained by purchase, spoke of the necessity of obtaining further contributions, both of money and books, in order adequately to carry out the objects of the library. The hon. secretary announced that the following names had been added to the largely increasing list of members:—Messrs. Christopher James and Frederick Seed, Major Austen, and the Rev. Henry Girdlestone; also that Prof. Buckman had been elected a corresponding member of the society.

Mr. Henry K. Jordan, F.G.S., read a paper on "The Rock-boring Mollusca." The perforation of rock by various species of shell-fish had occupied the attention of naturalists from as early a period as 1684, and even at the present time observers were not agreed upon the manner in which it was effected. In Messrs. Forbes and Hanley's standard work five theories were put forward. That the perforation was caused:—1. By the rotation of the valves of the shell, which acted as an auger. 2. By the rasping of siliceous particles imbedded in the soft body of the animal. 3. By currents of water directed on the rock by cilia covering the body of the animal. 4. By the secretion of an acid, which acted chemically upon the rock. 5. By the combined action of rasping and an acid. The author, stating that the second and third theories were open to very obvious objections, therefore meeting with slight acceptance, and that the fifth was simply a combination of the first and fourth, proceeded to urge objections to those two. With regard to the shell being the instrument of perforation, it was exceedingly fragile in many cases, and often less hard than the rock itself—nor was it of a shape suitable for boring; besides, unless the foot were protruded, which would separate the shell from the rock, the animal would have no power to rotate its shell. The chemical theory was open to many objections. There was no acid known which would dissolve limestone, sandstone, amber, wood, &c., indifferently, and if an acid were secreted, no organs for which had been found, it would probably dissolve the shell as well as the rock. Another theory had been lately published, according to which the hyaline stylite, a special organ, the use of which was not fully understood, was the instrument of perforation, but it was also found in molluscs which did not bore. Careful observation for many years had induced the author to consider the principle put forth 120 years ago by Sellius, a Dutch naturalist, and now supported by Mr. J. Gwyn Jeffries as the true one—viz., that the foot of the mollusc, by pressure applied during the revolving motion, caused the perforation. Mr. Jordan was disposed to consider that the shell rotated as well as the foot. When the mollusc recommenced boring, the foot was protruded, and the shell was thus lifted, and jammed in the upper and smaller part of the hole, the whole force of the animal being then expended in pressing the foot against the bottom, when a partial revolution was made, the shell remaining stationary. The adductor muscles were next contracted, drawing the valves together, and thus a partial retraction of the foot taking place also, the shell was liberated, which then rotated to its normal position, and in doing this, certain transverse striæ were formed, which it was difficult to account for in any other way. The detritus

acted as a fretting powder, working under the foot. This theory represented a mode of working more in accordance with that of many molluscs, as the Solen, Cardium, Mactra, Dentalium, &c., which rapidly burrowed holes in mud and sand by the action of the foot. Mr. Jeffries concluded his paper with some remarks upon the geological importance of these rock-boring mollusca, and reflections upon the wisdom of the Creator suggested by the contemplation of the perfection of his works. The paper was illustrated by a collection of every British species of Pholas, *in situ*, and of many other rock-boring molluscs.

In the discussion which ensued, Mr. Leipner reminded the society of Mr. Graham Ponton's paper, read in March last, when the author mentioned rock-boring as one of the functions of the foot of the Conchifera. Mr. Sanders and Mr. Carpenter alluded to the use of the siliceous tongue possessed by many Gasteropods as an instrument of perforation. Mr. Stoddart, Mr. Lobb, and others, also took part in the discussion.

The second paper was by Mr. Henry Brightman, on the application of the Photographic printing process for producing copies of botanical and other specimens. To lay plants, &c., upon prepared paper, and expose them to sunlight, was a method which had been frequently practised, but the pictures so obtained were, technically, negatives, the representation of the object being white, on a dark ground. It occurred to the author that if these could be rendered transparent positives might be printed from them. He found, however, that this could be readily done without any previous preparation of the negative, and he exhibited a number of very beautiful photographs produced in this way of ferns, leaves, and even a butterfly's wing, showing the wide applicability of the process. Mr. Brightman then described the process in detail; for the negatives the albumenised paper should be as thin and free from grain as possible, and sensitised by floating on a 60-grain solution of nitrate of silver. An ordinary printing frame was used, but a very long exposure was requisite, especially for positives, and this constituted the chief objection to the process where many copies were required, as for illustrating a book. The toning bath contained half an ounce of acetate of soda to one pint of water, and one grain of chloride of gold for each sheet toned. The picture was fixed with hyposulphite of soda (eight ounces to the pint), and well washed with water.

Much conversation then took place on this paper, in the course of which Mr. Beattie urged the employment of waxed paper, instead of albumenised, as likely to give a more transparent negative, and spoke of the application of carbon printing to this process. Mr. Brightman suggested the use of a green instead of a black pigment in that method, to give the natural colour of the plant. Mr. Ravis mentioned the expense of the silver process as an obstacle to its employment on a large scale. The possibility of printing negatives on dry collodion or tannin plates was suggested.

Mr. J. W. Clarke exhibited a beautiful case of living reptiles, containing examples of the orders Ophidia (snakes), and Sauria (lizards) in the class Reptilia, and of the class Batrachia. The green lizards he had kept for many years, and fed them on any kind of living insect; they only partially hybernated in confinement. The German salamanders also readily lived in confinement. The sloe or blind worm was not really a snake but a Saurian, as it possessed rudimentary legs under the skin. Mr. Leipner, in making some remarks upon these animals, referred to the new species of British snake, Coronella, so named from the emerald green crown on its head, and expressed a desire to obtain a specimen. Mr. Clarke said that doubtless many had been destroyed, being mistaken for adders; their bite was not poisonous, and they could be domesticated, but would only eat small lizards in confinement. Mr. Sanders referred to the marks upon slabs of stone found in Cheshire as having been probably produced by snakes wriggling upon soft mud, which was afterwards consolidated.

Mr. Halsall exhibited some corks of wine bottles which had been eaten by an insect, causing much loss of wine, and some minute insects found in the boring of the cork. Much doubt was expressed by entomologists present whether the insect thus found was the cause of the damage.

The remainder of the evening was devoted to general conversation, and an examination of the books and specimens on the table.

WM. LANT CARPENTER,

Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

SECTIONAL MEETINGS.

[*From the Bristol Daily Post, December 18th,* 1865.]

BOTANICAL SECTION, Nov. 16.—Mr. Leipner, president, in the chair. Mr. Yabbicom, the secretary, opened the discussion of the subject of Starch, illustrating his remarks with a number of specimens and microscopic preparations. Starch, which existed in some part of nearly all plants, was of three kinds, that known as common starch being most frequently met with. It might be extracted from seeds, as wheat, barley, rice, beans, horse chestnuts (which contained 17.4 per cent.), and many others; from stems, as the sago palm; from underground stems or bulbous roots, as the carrot, turnip, hyacinth, and potato, where it was very abundant; and from roots, as in Maranta arundinacea, the source of arrowroot; the manioc, which afforded tapioca, celery, and others. Most of the fancy cornflowers consisted chiefly, if not entirely, of pure starch from maize. The two other kinds of starch were Inuline, found in the roots of Inula, Angelica, &c., and Lichnine, which existed, though not in a granular form, in many mosses and lichens. The grains of starch, as shown by the microscope, differed in size in nearly every plant, a fact which was taken advantage of in investigating the adulterations of commercial articles. The close chemical resemblance of starch to grape sugar was noticed, and its gradual change into the latter substance during germination, as in malting. Some experiments were shown, illustrating the manufacture of dextrin or British gum from starch by heating it to above 240° Fah., and also the blue colour produced by a solution of iodine on starch. Mr. H. Charbonnier exhibited starches extracted from maize, the acorn, and horse chestnut, the roots of Ranunculus bulbosus, the pulp of the apple, &c.; and Mr. G. W. Parker, jun., a number of microscopic preparations, chiefly illustrating the adulteration of arrowroot.

GEOLOGICAL SECTION, Nov. 23.—Mr. W. Sanders, F.G.S., the president of the section, described the characters of the several beds of the old red sandstone, and their general distribution in the United Kingdom and over Europe. In Scotland the three divisions were well marked, petrologically and palæontologically, the lowest containing a rolled conglomerate, proving the sea of that era to have been in great agitation, while the uppermost strata were deposited in calm water, in which flourished the Holoptychius and carboniferous plants. In the West of England and South Wales it was frequently absent from between the carboniferous and silurian series, but between Coalbrookdale and Haverfordwest it attained a thickness of 10,000 feet. Here the upper division is conglomerate and nearly unfossiliferous. In some places, as at East Angle Bay in Pembrokeshire, no distinct boundary line could be discovered between the old red and silurian series. Owing to denudation, the highest part of the Mendips was seldom, as in Wales, composed of old red sandstone. A very peculiar sandy bed, containing loose pebbles, was noticed as occurring at Portbury, Leigh, and other places near Bristol. In Devonshire the rocks were slaty and schistoze, and not ferruginous. In Ireland, the bulk of the formation was in the south, and well seen on the coast; the strata were distinctly divided into two parts, as was also the case in Lanarkshire. Mr. Sanders concluded by lucidly describing the old red sandstone as found in Europe, North America, and the Cape of Good Hope, alluding to the fossils of the Eifel district, and the interest attached to the beds in Russia, where they had an enormous superficial area, but very little thickness, and contained the well-known fishes of Scotland and the shells of Devonshire.

The following is an abstract of Mr. Leipner's communication upon Devonian Corals, at the October meeting of the section. He appeared as the spokesman of Mr. Spencer Percival, of Henbury, upon two species of Devonian Corals, described by Messrs. Milne Edwards, and Jules Haime, viz., Cyathophyllum cœspitosum, and Pachyphyllum Devoniense. To found a new species upon a single specimen, unless specially marked with undoubted individual character, was at all times a hazardous undertaking, but when the organisms, as was the case with corals, were liable to great departures from a type, such a step ought to be taken with the most extreme caution. Indeed, Mr. Leipner unhesitatingly affirmed that the limits of each species could never be defined correctly, and its essential characters delineated, until the Coral beds of a given locality had been patiently and carefully investigated, as Mr. Percival had done at Withycomb, North Somerset. The opportunities the author had had of examining and naming a great number of corals strongly enforced this maxim upon his mind, more particularly in reference to the Palæozoic corals. Mr. Percival had obtained a series of fasciculated and astreiform specimens of Cyathophyllum cœspitosum from Withycomb, which were exhibited, and the latter, *i. e.*, the astreiform specimens answered so fully to Milne Edwards' Pachyphyllum Devoniense—a species founded upon a single specimen —as to make Mr. Percival arrive at the conclusion that Pachyphyllum Devoniense is but the astreiform variety of Cyathophyllum cœspitosum. Independently of this, Mr. Leipner called upon the members carefully to compare the descriptions and illustrations of these two species, as given in the monograph, and he ventured to assert that even from this alone they could not but arrive at the same conclusion. He also showed the specimens belonging to the museum of the Institution, which had been named by Mr. Lonsdale according to the monograph, and pointed out that there was no essential difference between them, except that the specimen of Pachyphyllum was of course astreiform, and those of Cyathophyllum fasciculate. The specimens recently presented by Mr. Percival supplied the connecting link, furnishing instances of the latter species occurring both fasciculate and astreiform in the same specimen.

Entomological Section, Dec. 12.—Mr. Stephen Barton, president, in the chair. Mr. A. E. Hudd exhibited some fine specimens of Dasypolia templi, Colias Edusa, variety Helice, and Colias Hyale. Mr. Cole exhibited a fine lepidopterous insect, the wings of which measured nine inches in expanse, and, being unknown to all the members present, some discussion took place as to the division to which it belonged. The Secretary exhibited a pair of bred specimens of Deilephila Galii, a fine species, the larva of which feeds on Galium verum, and has been taken near Clevedon and at Brean-down. Also Chærocampa Celerio, captured near Worcester; Agrotis cinerea, one of two specimens taken on Durdham-down; and a specimen of Mamestra abjecta. The President then read a short paper on the Coleoptera of St. Helena, illustrating it with specimens taken by himself. After giving a brief sketch of the island and its productions, Mr. Barton went on to remark that the number of species of Coleoptera occurring at St. Helena was surprisingly small. A week's collecting only produced seven species, viz., Calosoma Helenæ, Pristonychus complanatus, Heteronychus arator, Longitarsus Helenæ, Cydonia lunata, Opatrum nadroides, and Necrobia rufipes. The author, after some amusing reminiscences of his visit to the island, remarked that the extreme paucity of insect life might be accounted for by the insular position of St. Helena, and also by the destruction of the forest that covered the island when first discovered.

Chemical and Photographic Section, Dec. 13.—Mr. Charles Hill in the chair. Mr. W. L. Carpenter read a paper on Pharoah's Serpents' eggs, the chemical toy now so common, and gave the results of experiments that he had made to ascertain the composition of the serpent. As was well known, the white powder forming the egg was sulphocyanide of mercury, and the author described several modes of preparing it. Theoretically represented by the formula Hg. Cy. H2, it would contain 63·3 per cent. of mercury, and the specimen he analysed yielded 64.9 per cent. The loss of weight on burning was 19·27 per cent., and as the product contained 70.5 per cent. of mercury, it followed that about one-seventh of the mercury in the egg was volatilised. He showed an experiment to prove that the serpent form was not, as was generally supposed, caused by the cone of tinfoil, and described others which led him to believe that the blackness of the inside of the serpent was due to the mechanical mixture of sulphide of mercury with mellon, or melam, products of the decomposition of the sulphocyanides which had been studied by Liebig. The brown exterior contained no sulphide of mercury, and, when treated with nitro-hydrochloric acid, yielded a solution in which sulphuretted hydrogen caused a yellow flocculent precipitate, the nature of which he had not ascertained. The specific gravity of the serpent was 0.069, water being 1·000, and such was the continuity of the skin that no air escaped through it when the serpent was sunk in water. Mr. Carpenter then exhibited a photograph, sent by Mr. P. J. Worsley, showing what facilities the paper process gave for getting quantity, and also the desirable quality of size, as well as the advantages over working with glass plates as regarded portable apparatus. A friend of Mr. Worsley's had taken out, on a trip, seventy sheets ready prepared by the turpentine waxed paper process, and had had no failure among them, although the exposures varied from five minutes to four hours. Mr. Noble, the secretary, exhibited a series of very beautiful paper negatives, taken by Mr. West, of the Clifton Observatory, of large size. The process was the ordinary iodized paper one, the sheets being waxed either before or after exposure, no preference being given to either. It was generally allowed by those present that where long exposure and slow development were possible, no process was equal to this for the exceeding beauty of detail obtainable by it.

Zoological Section, Dec. 14.—The officers of the section being absent, and only three members attending, the meeting was adjourned until January.

T. H. YABBICOM,
F. ASHMEAD,
G. HARDING, Junr., *Sectional Secretaries.*
A. NOBLE,
S. H. SWAYNE,

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

[*From the Bristol Daily Post, January 8th,* 1866.]

The usual monthly general meeting was held on Thursday evening last, at the Philosophical Institution, and was fairly attended by members and visitors. Mr. W. Sanders, F.R.S., the president, occupied the chair, and, after the transaction of the routine business, rose and said that it was his painful duty to announce the death of Mr. George E. Roberts, one of the corresponding members of the society—a gentleman who was well-known for his geological researches in the field. The hon. secretary then brought forward several donations of books to the library, after which Dr. Henry Fripp read a paper "On the vision of the fish, and on certain structural peculiarities of the fish's eye," which was illustrated with a number of very beautiful anatomical and other diagrams, as well as several fish from the museum of the Institution.

Dr. Fripp commenced with a brief exposition of the general sensory endowments of the fish, showing the relative inferiority of the senses of taste, touch, smell, and hearing, and the marked development of the organ and faculty of sight. The singular arrangement of a body without limbs, adapted to rapid locomotion by muscles of the trunk, was shown to meet exactly the problem of the progression of an animal immersed in water, and examples were cited showing the extraordinary muscular power developed by various fishes. The control and direction of this muscular power were considered as mainly dependent on the quickness and accuracy of vision. The quantity and quality of subaqueous light were next commented on, and the variation of light in strata of different depths as affected by the different states of the surface water, *e.g.*, their state of rest and motion, purity, &c., as also by the state of sunlit or clouded atmosphere, and instances of vision exercised by fish of different depths under the surface were given. The position of the eye, the direction of line of vision, and the extent of the sphere of vision in different species of fish, came next under review, and the immobility of the pupil and the optical questions connected therewith were explained at some length, and contrasted with the movements of the iris in mammal eyes, the physical advantages gained by change of pupilary opening being pointed out.

The second part of the paper was devoted to anatomical details of structure of the different parts of the eye, each coat or tunic of the eye-ball being described and compared with analogous parts in the mammal eye. The anatomy of the choroid coat, ciliary processes, and iris was given in detail, and in particular that portion of the vascular distribution of the choroid vessels, commonly called "choroid gland," was described and illustrated by drawings. Dr. Fripp, after briefly stating the views of anatomists upon this point, expressed his disbelief in the usual explanations of the function of that "choroid gland," and gave reasons for the conclusion that the structure was neither glandular nor muscular, and that it had no influence on the so-called "accommodation" of position of the lens to near and distant vision. In considering the position of the lens, it was shown that no forward movement of the lens was possible, and also that the peculiar hardness and inelasticity of the lens did not admit of the explanation of "accommodation" by alteration of place or form of its curved surfaces. The principle of "accommodation," and the mode in which it was effected in the human eye, were explained and illustrated.

The improbability of a similar "accommodation" in the fish's eye was argued on anatomical and physiological grounds, emphasis being laid on the absence of a ciliary muscle, the non-development of the ciliary processes, the form, position, and structure of the lens, and the immobility of the iris and pupilary opening. The supposed relation of the "choroid gland" to any function of "accommodation" was negatived by consideration of the static condition of the circulation in the vessels of the "gland," and the author attempted to show that this static condition of the circulatory blood stood in direct relation to the varying pressure on the surface of the fish's body at varying depths under the surface of the water. The meaning of this peculiar arrangement of vessels was thus interpreted in connexion with the dynamic force exerted by the heart in propelling its contents through the system under varying pressure on the surface of the fish's body, of which surface the cornea of the eye formed a part. Allusion was made to the peculiarity of venous circulation in fishes and mammals which live under water.

In conclusion, Dr. Fripp proposed the following theory:— 1. That the fish's eye was in its normal state arranged for vision of near objects, and that the great refractive power of a prolate spheroid lens such as exists in the fish was adequate to the production of a picture at short focal distances even with rays of light passing through so dense a medium as water. 2. That there was no accommodation of the fish's eye for extended limits of vision. 3. That the *passive* state of the fish's eye being that in which it is enabled to see objects near and at moderate distance, no *active* or physiological change for accommodation of sight for distant objects took place or seemed necessary. The dioptric arrangement being the reverse of that which obtains in animals where "accommodation" is observed, and in whom the *passive state* is that of vision arranged for distant objects, whilst the *active state* is that of vision accommodated at will for near objects. 4. That the vascular distribution of the choroid vessels has no relation to any movement of the lens or change of its shape, but is arranged to meet the changes of static condition of the circulating fluid and of dynamic force exerted by the heart under varying pressure from without, and that, by such an arrangement, protection to the delicate tissues of the eye is afforded by a compensating balance between the tension of the blood within the vessels and the external pressure exerted upon them.

In thanking Dr. Fripp for his exhaustive paper, the President remarked upon the profound thought and condensation of a large amount of observation displayed in it, and spoke of the honour thus reflected upon the society, as well as of the highest credit being due to the author.

Mr. W. L. Carpenter then read two short communications[1] the first being entitled "Note on Pharoah's Serpents' Eggs." The author recapitulated, in general terms, the results of the analyses of the serpent and its egg, lately brought before the Chemical and Photographic Section, and insisted strongly on the danger of burning them in small rooms with little ventilation, on account of the large amount (one-seventh) of the mercury contained in the egg being volatilised, and he alluded to the ill effects he and others had observed to arise from them. He mentioned the insidious and distressing symptoms of poisoning by mercury vapour, and concluded by describing what he believed to be the reason of the fantastic forms and extraordinary increase of bulk sustained by the sulphocyanide of mercury when decomposed by heat. The second was a note upon the artificial formation of flint. After briefly alluding to the various natural deposits of silica, and the nature of some of the compounds of silicic acid, Mr. Carpenter said that in decomposing on a large scale a solution of silicate of soda by a mineral acid on one occasion, the silica, at first gelatinous, became quickly

agglomerated under water into a very hard semi-transparent mass, resembling flint in its fracture and other respects. The point of interest in connexion with it was the shortness of time and small amount of pressure required for the transformation of the soft gelatinous into the hard siliceous-like condition. Mr. A. Noble mentioned having formed a substance resembling flint by first gelatinising, and then drying in air an aqueous solution of silicic acid obtained by dialysis. The lateness of the hour prevented any further discussion on any of the papers.

WM. LANT CARPENTER,

Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

SECTIONAL MEETINGS.

[*From the Bristol Daily Post, January 22nd,* 1866.]

Botanical Section, December 22.—The President, Mr. Leipner, occupied the chair. The subject selected for discussion was "Vegetable Raphides, or minute crystals of lime in the tissues of plants." The President said that raphides were formerly thought to be only concretionary formations, arising from decay or death in the part where they were found, but that, recently, from the researches of Professor Lindley and others, they had begun to attract increased attention, and to assume a far more important position in the vegetable economy, from the fact that they were found of the same appearance in all plants of certain orders, and were always absent in others, thus appearing to furnish another link for the classification of plants where the characteristics might be otherwise doubtful or confused. In this way the similarity between the vine and ivy tribes might be seen. Raphides consisted of oxalic, phosphoric, or other organic acid, in combination with lime, and were sometimes met with in great abundance, at others but sparingly. Artificial raphides had been formed in the tissues of rice-paper, soaked in lime water, by forcing oxalic acid in by means of the air-pump. It was very rarely that more than one sort of raphides had been found in the same plant, but Mr. Leipner exhibited the section of an endogenous stem which contained two quite distinct forms. Sometimes they were arranged very regularly, as in the crocus, where they ran in parallel lines. Mr. A. J. Parker, jun., had found raphides of a brick shape in the caticle of the onion. Mr. Charbonnier showed preparations from garlic and Turkey rhubarb, where they were very abundant, and consisted of prisms collected into star-shaped masses; also needle-shaped crystals from the sepals of the fuschia. Mr. Yabbicom exhibited raphides from the root of the Turkey rhubarb and the bulb of the hyacinth, where they were seen as long needle-shaped prisms; Cascarilla bark occurring in the shape of rhomboid plates, and Cinchona bark in cubical masses. Among the woody fibre of the stems of the fuschia they were found abundantly, of the same appearance as those before-mentioned, which were very similar to some shown from the pith of the vine. In the leaves of Agapanthus umbellatus, the hyacinth and aloe, they occurred of the needle form, those from the old leaves of the latter plant being very large. In the cactus they were so abundant as to cover the section of the leaf with a white powder, which was seen with the microscope to consist of quadrangular prisms collected in masses. It was mentioned that some species of cactus were so laden with raphides as to make the plant quite brittle.

Geological Section.—As the evening for this section fell in Christmas week, the meeting was postponed for a month.

Entomological Section, January 9.—Mr. John Bolt in the chair. After the minutes of the last meeting had been read and confirmed, the members present, in accordance with rule 3 of the section, proceeded to elect a president and hon. secretary for the ensuing year. Mr. Stephen Barton was re-elected president, and Mr. Geo. Harding, jun., secretary. The secretary then read the accounts of the section for the previous year, showing a small balance due to him.

Chemical and Photographic Section, January 10.—Dr. W. B. Herapath, F.R.S., in the chair. After passing the accounts for 1865, the meeting proceeded to ballot for the officers of the section for the ensuing year. Mr. Alfred Noble was elected hon. secretary, and Mr. P. J. Worsley, F.C.S., president. Mr. W. L. Carpenter proposed a vote of thanks to the retiring officers, and Dr. Herapath, in vacating

the chair, spoke of the great interest he felt in the section, and his regret at not having been able to devote more time to it, as well as of the good feeling which existed among all the members. Mr. Worsley, in assuming office, said that, coming as he did after a man of such genius as Dr. Herapath, he would have to claim the indulgence of the members, though he could yield to no one in an earnest desire to promote the objects for which this section of the Naturalists' Society had been established, and that, although a purely scientific subject was not always attractive, a photographic one ought to be, and it would be his endeavour to render the meetings as generally interesting as possible.

Mr. WORSLEY then read some notes of observations made by himself and Mr. Gillford on the comparative solubilities of chloride, bromide, and iodide of silver in hyposulphite of soda. 100 parts of this dry salt would dissolve 90 per cent. of chloride of silver, and nearly as much bromide, but only about 5 per cent. of iodide, or, if the solution were heated and allowed to cool, about six per cent., the quantity being also influenced by the amount of alkaline iodide present. The solution of chloride or bromide in the hypo contained a double hyposulphite of silver and soda, characterised by a sweet taste, and by being only decomposed with difficulty by boiling, while with the solution of iodide there was no sweet taste, and if an attempt were made to crystallise the solution, pure iodide of silver separated out, showing that it had not been decomposed. Further, there was a great difference in the action of an excess of the halogen salt on the solution. If chloride of potassium were added to a solution of chloride of silver in hyposulphite of soda, no effect was produced; but if iodide of potassium were added to iodide of silver similarly dissolved, a precipitate of iodide of silver was formed, which could only be re-dissolved with very great difficulty by a large excess of hyposulphite of soda. This was very anomalous, and Mr. Worsley could offer no explanation of the fact, nor did any suggestion occur to any member present to account for it.

ZOOLOGICAL SECTION, JAN. 12TH.—Dr. Henry Fripp, president, in the chair. The audited cash account for the past year was read, showing a small balance in hand. Referring to the six meetings which had been held, the president remarked upon the necessity for more active co-operation on the parts of the members of the section, if it were to be carried on satisfactorily, and hoped that more zeal would be shown in future. The election of officers of the section then took place, Dr. Fripp being chosen president, and Mr. S. H. Swayne hon. secretary for the ensuing year. Mr. C. O. Groome Napier exhibited a specimen of loligo media, found in 1865 at Clevedon, and remarked that these species of loligo secrete a brown fluid lighter in colour than true sepia. He also showed a male skylark, alanda arvensis, of abnormal colour, a kind of fawn colour, resembling a cream-coloured lark of South Europe in plumage, but not in the form of the bill.

T. H. YABBICOM,
G. HARDING, JUNR.,
A. NOBLE,
S. H. SWAYNE,
Sectional Secretaries.

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

[*From the Bristol Daily Post, February 5th,* 1866.]

The usual monthly general meeting took place at the Philosophical Institution on Thursday last, when, notwithstanding the stormy character of the evening, there was a good attendance of members and their friends. Mr. W. Sanders, F.R.S., presided. The hon. secretary announced the following elections of ordinary members:—Messrs. G. Gillford, F. R. Bernard, T. Usher, and R. S. Standerwick; also the following donations to the society's library: Lovell Reeve's "British Land and Fresh Water Mollusca," presented by Mr. W. James; "Memoir and Papers of Hugh E. Strickland," presented by Mr. W. H. L. Walcott; "The Food, Use, and Beauty of British Birds," by C. O. Groome Napier, presented by the author.

Mr. W. W. STODDART read a note on Involutina liassica, a microscopic fossil, new to the Bristol district. At the Bath meeting of the British Association, Mr. Brady, of Newcastle, had read a paper announcing the discovery of this fossil in the lias beds at Fretherne cliff and Defford, and had then proposed the above name for it. Mr. Stoddart had been fortunate enough to meet with it at Horfield, and after stating that it belonged to the lowest division of animal life, Foramenifera, he gave a general outline of the characteristics of this group, with the classification proposed by Dr. Carpenter in his monograph, and illustrated his remarks with some photographs projected on a screen by the oxyhydrogen microscope; the whole group being divided according to the character of the shell into Porcellanous, Hyaline or vitreous, and Arenaceous: the fossil described by the author belonged to the last division, in structure lying between Rotalina and Trochammina, and considered by Mr. Brady as possibly a pseudomorph of Pulvinulina. In character it was discoidal, biconvex, from 1-15th to 1-70th of an inch in diameter, and 1-48th inch thick—granulated, the outer edge raised—spiral walls, with straight septa.

Mr. Thomas Pease, F.G.S., one of the vice-presidents, then read a paper by the Rev. Gilbert N. Smith, of Gumfreston, on "Recent Researches in a Bone Cave near Tenby." This cave, called "The Hoils," or Haul's Mouth, was in an undercliff of the mountain limestone, conspicuously facing the sunrise, whence probably its name was derived. Having been long an object of curiosity, it had been much disturbed, and its contents were first reported on at the Oxford meeting of the British Association by the author. The floor was composed of stalagmitic breccia, three or four inches thick, which had long been broken up, except in patches in one or two corners, one of which was broken up for the first time in July last, when two femurs of a bear, still in position, and unquestionably of the oldest bones, were extracted. Among the disturbed earth and stones, half a lower human jaw was found, a good many chert and flint flakes, and, as if to set all speculation of relative age at rest, five unworn Irish harp halfpence of the reign of George III. In October last search was made for the rest of the human skeleton, the plan adopted being to shovel into the light at the entrance all the soil from the beginning of the passage, and in a recess the greater part of the vertebræ, the blade bones, radius and ulna, and other remains of the same, or another, human skeleton were found. These, however, had not attained to that increase of weight and peculiar dense fossil character so well known in cave bones. In the dis-

turbed soil in another part of the cave were found two molars of a bear, other carnivorous teeth, and a tusk, also the prong of a deer's antler. In all, 200 flint flakes, including some "scrapers," and two or three "coves" from which they appeared to have been removed, were found, and larger flaky amorphous pieces of the same greenish, spotted, cherty trap, of which the largest flakes were composed. The cave itself had been thrown off and aside, apparently by the elevation of a ridge the Old Red, extending about ten miles between Tenby and Pembroke. A valley, with a rivulet at the bottom, extended at the base of the limestone cliff, and this valley was at the present day liable to be flooded at spring tides. The paper was concluded by a few surmises, conclusions, and suggestions offered by Mr. Smith. The limestone having been formed soft and horizontal on the sea bed and then elevated, all the animals whose bones have been collected in the cave must have lived and multiplied before the sea washed into it again. Also, these remains in general were carried into the cave by the larger carnivora, though possibly by man, the flint flake maker. With respect to the relative date of the deposits, no conclusion could be drawn, except that they continued from the time the cave bear, hippopotamus, &c., were indigenous until the present. As the tumuli on the ridge above the cave contained flint arrowheads, probably the race of men who used the flints were not far to seek, and *apropos* of flint knives, a reference was made to a passage in the book of Joshua, recording the burying of flint (sacrificial) knives in his tumulus. With regard to the thickness of a stalagmite the author referred to the pendulous incrustations under railway bridges as a proof of quick formation, and he also inferred that floods or large volumes of water must have at times entered the cave to produce the results discovered. After reading the manuscript Mr. Pearse exhibited several of the bones, teeth, flint flakes, and also the halfpence which Mr. Smith had kindly forwarded to illustrate his paper.

The President, Mr. Sanders, observed that, treating the antiquity of man as a purely scientific question, it was difficult to estimate aright the value of such evidence as this. He exhibited some flints from the valley of the Somme and also some early British spear points, arrow heads, &c., found in 1835 by Mr. Francis and Mr. Gwyn Jeffries, at Paviland, under a thick coat of stalagmite. The evidence regarding the formation of stalagmite was very conflicting. Men of moderate views, accustomed to observe carefully, and who were looked up to, had come to the conclusion that these flints, &c., were contemporaneous with extinct animals, as well as with animals believed to be far more recent. Though the evidence from the gravel-beds might be conclusive, that from caves was not so.

In the discussion which followed, Mr. Jordan elicited from Mr. Swayne the information that the mollusca found in the cave were marine, and referred to the evidence of a depression of the land for about 40 feet near Tenby. Major Giberne mentioned the gradual obstruction of the porosity of limestone by filtration, and described some oscillations in the level of land that he had noticed in India. Mr. A. Leipner explained that the rapidly-formed stalagmites under railway arches were due to the hydrate of lime in the mortar, which was many times more soluble than carbonate of lime. Mr. Atchley suggested that a current of air had probably great influence on the rate of formation of stalagmite. Mr. Stoddart referred to Mr. Pengelley's paper, and the discovery of a copper pin under nine inches of stalagmite. He also confirmed Mr. Leipner's remark, and said that the microscopic appearance of the two kinds was very different.

Mr. C. O. Groome Napier exhibited a specimen of the spur-winged plover, a bird common in Egypt, which was known to enter the crocodile's mouth, for the purpose, probably, of removing leeches. It had a remarkably sharp horny spur on the wing, the use of which was not known. It was very cunning, unlike the Dottrell, to which it was allied, and eggs of which were exhibited. This bird, as was well-known, was very foolish, and rarely bred in Britain. Mr. Pease and Mr. Swayne questioned the existence of leeches, but believed the plover acted as a kind of living toothpick to the crocodile. Mr. Napier also exhibited a cocoon of the tarantula spider, from Tobago, which had contained 100 eggs, about the size of rape-seed.

WM. LANT CARPENTER,

Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

SECTIONAL MEETINGS.

From the Bristol Daily Post *of February 20th,* 1866.

Botanical Section, January 19.—The president, Mr. Leipner, occupied the chair. The honorary secretary read the accounts for the previous year, showing a balance in hand, which were passed, and a subscription of half-a-guinea was voted to the library fund of the parent society. The officers of the section were then re-elected to their respective departments by acclamation, with thanks for their past services. Mr. Leipner begged to thank the members for their confidence in him, and said, that although he still felt the greatest interest in the welfare of the section, yet in consequence of his numerous engagements he could not give that attention to its interests which he could have wished, and therefore he should be glad if the members would name some other gentleman to occupy the chair. It, however, seemed so much the wish of those present that Mr. Leipner should continue to officiate, and attend or otherwise at his convenience, that he kindly consented to do so. The remainder of the evening was spent in preparing and mounting specimens of dried plants for the herbarium, which is being established by the section. They consisted of plants found within the district of the Bristol Naturalists' Society, and had been either gathered in the course of the field walks of the section during the past summer, or were supplied from the private collections of the members. Each of those present taking a separate department, a large number of specimens, which had been pressed and prepared by the secretary, were mounted and finished.

February 15.—Mr. A. Leipner, president, in the chair. The attendance of members was not very numerous, and the whole of the evening was devoted to the mountng and preparation of specimens for the society's herbarium, no papers or other business being brought forward.

Geological Section, Jan. 25.—Mr. W. Sanders, F.R.S., president, in the chair. The accounts for 1865 were read and passed, showing a balance in hand, out of which it was resolved to give a donation to the funds of the Naturalists' Society Library. The ballot was then taken for the officers of the section, Mr. Sanders being elected president, and Mr. F. Ashmead hon. secretary. Mr. W. L. Carpenter made a short communication on behalf of his father, Dr. Carpenter, on the oldest known fossil, Eozoon Canadense, showing the cumulative evidence, from a great variety of separate probabilities, that its structure was one of animal growth, although its organic nature had been lately called in question, and also announcing the discovery of the same fossil in the limestone beds of the great fundamental Gneiss of central Europe, which Sir R. Murchison had shown on other grounds to be the equivalent of the Canadian Laurentian rocks. Mr. W. W. Stoddart read some notes on Devonian Palæontology. Remarking that the beginning and end of this system were not characterised by the accession or disappearance of any peculiar fossils, he observed that Silurian fossils were found in the lower Old Red beds, and Carboniferous in the upper, and this was especially the case with the corals, which were very abundant, belonging chiefly to the Cyathophyllidæ. One kind of coral, Calceola gaudalina, had by some writers been mistaken for a Brachiopod. In the upper part of the series was a band filled with the valves of Cypridina, an Entomostracon. After giving a general view of the number of species in the system, Mr. Stoddart noticed some as being peculiarly Devonian, *e.g.*, Stringocephalus, Megalodon, Anodonta Jukesii, Clymenia, and others. The Devonian fishes were then described, as all belonging to two of Agassiz's orders, Placoid and Ganoid, and had, generally, heterocercal tails, the most curious being the

winged fishes, Pterichthys and Coccosteus. No reptiles had been discovered in the Devonian rocks, nor any animal organisms lower than zoophytes. Mr. Stoddart illustrated his paper with a number of the fossils he described, and Major Austin exhibited several also, as well as a sketch and map of the junction of the Devonian and Cambrian rocks in the county of Waterford.

Zoological Section, Feb. 8.—Dr. H. Fripp, president, in the chair. Mr. H. K. Jordan, F.G.S., exhibited a series of Helix Virgata, a new variety, of a dusky colour, for which he proposed the name H. Virgata, var. tenebrosa. Also, a series of Helix rufescens, var. depressa, a rare shell, found at Paignton, South Devon, and lately on Durdham-down. The president then showed and explained a large number of very beautiful microscopic preparations, illustrating anatomically the minute structure of the eyes of fishes. The crystalline lens, choroid coat, and pigment cells, the iris and ciliary processes were thus minutely examined, and especial attention was drawn to the peculiar arrangement of blood-vessels in what was commonly called the choroid gland, the function of which Dr. Fripp had endeavoured to explain in his recent paper read at the general meeting of the society in January. The separation of the arterial trunk soon after entering the eye into an immense number of exceedingly minute capillaries running parallel to each other and most closely packed, was well seen, and the subsequent reunion of these into a so-called venous, but, strictly speaking, arterial sinus, whence the blood was distributed to nourish the tissues of the eye, was clearly demonstrated.

Entomological Section, Feb. 13.—No report of this meeting has been received.

Chemical and Photographic Section, Feb. 15.—Mr. P. J. Worsley, B.A., F.C.S., president, in the chair. Mr. J. R. Rogers introduced a discussion upon specific heat. After some preliminary remarks upon the varying capacity of bodies for heat, and the meaning of the term specific heat, he raised the question whether there was any relation between the specific heats and atomic volumes of bodies, and pointed out that with many gases, if the numbers representing their specific heats, equal volumes being compared, were divided by the numbers representing their specific heats, equal weights being compared, the quotient was either the atomic weight of the substance, or bore a simple relation to it. Mr. Rogers then suggested as a possible theory of the constitution of matter the hypothesis that the ultimate atoms of bodies were hollow spheres, with heat contained in them, and that the capacity for heat of the substance depended upon the thickness of the films of these hollow spheres. A short discussion ensued, during which Mr. Beattie, Mr. Noble, Mr. Carpenter, and the president addressed the meeting. Mr. W. L. Carpenter then exhibited and explained an adaptation of the spectroscope to the microscope, first suggested by Mr. Sarby, with which he had made several observations. He described the mode of using the combined instruments, as well as other ways of applying the two together, and promised to show some of the effects produced by it at the next meeting of the section.

T. H. YABBICOM,
F. ASHMEAD,
S. H. SWAYNE,
A. NOBLE, } *Sectional Secretaries.*

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL NATURALISTS' SOCIETY.

From the Bristol Daily Post *of March 5th,* 1866.

The usual monthly general meeting was held at the Philosophical Institution on Thursday evening last. Mr. W. Sanders, F.R.S., the president, occupied the chair, and there was an average attendance of members and their friends, including ladies. After the transaction of some private business relating to the form in which the proceedings of the society should be printed, the hon. secretary announced donations to the society's library of half a guinea from the Botanical Section, and one guinea, with a volume of the Geological Magazine, from the Geological Section.

Mr. W. W. Stoddart exhibited a piece of bamboo cane, which had been buried in the earth, and then incinerated, showing casts of the siliceous cells in the plant, hanging together in a remarkable manner. He also read an extract from a letter of the Rev. G. N. Smith in reference to that gentleman's account of researches in a bone cave at Tenby, read at the previous meeting, from which it appeared that, though the bones of the bear, &c., were found underneath the undisturbed stalagmite, and were therefore very old, the flint flakes were not, and hence there were no data for determining the age of these.

Mr. Charles F. Ravis then read a paper on amber, communicated by Mr. Philip John Butler, of London. Mr. Ravis recalled the fact that about two years ago he had exhibited to the society some beautiful specimens of amber, specially with reference to the insects therein contained, and had then made a short communication upon the subject. These specimens had been lent by Mr. Butler, who had since been pursuing his researches, which were embodied in a paper read at the Linnean Society in London, on December 21st, 1865. This paper Mr. Ravis read, adding also a few remarks of his own in the course of it. That amber was a fossil resin, and that most of what was obtained at the present day was disrupted from the submerged forests under the Baltic Sea, was now generally admitted. Its resinous character was known in the first century of the Christian era, although some of the ancients adopted the wildest theories respecting it, instances of which were given from Sophocles, Ovid, and other writers. That many of the ancients were wrong in their conclusions was certain, and it was equally certain that many in our own day were equally mistaken in supposing specimens to be amber which were only recent resin. Gum animi frequently contained insects, and was hence often confounded with amber, even in museum specimens, and instances had occurred of some authors, in entomological catalogues, actually mingling fossil species of insects in amber with existing species in modern resins. The weight of the largest piece of amber in the British Museum was 41oz., but at Berlin there were larger specimens. The chief use of amber was in connexion with meerschaum clay, animi being used for varnish. Mr. Ravis here read some notes on two recent resins, confounded with amber, viz., copal and animi. Copal was the Mexican term for gum as well as resin, the resin so called being the produce of Rhus Copallinum; it rarely or never contained insects. Animi was a product of the Eastern hemisphere only; it exuded from Vateria Indica, a gigantic tree of Malabar, and was formerly sold in Indian bazaars under the term Sandross. The Portuguese knew it in 1498, and on settling in South America in 1549 they misapplied the term animi to the resin of New Spain. In continuing Mr. Butler's paper, the following ready mode of distinguishing amber from animi was given. The specimen being polished, was to be placed in cold water, which should be gradually heated to boiling; animi thus treated, frequently, even before the water reached 200°, but always on boiling, lost its brilliancy, and was much altered in appearance and shape, while amber was unchanged. Some instances were then

given of specimens of amber containing fish, which were evidently manufactured, and not of natural occurrence. The author then described his microscopic investigations into the cause of the cloudiness in amber, an appearance which was due to the presence of an immense number of small cavities, of very various shapes, some containing fluid only, others probably gas, or even vacuity, and others again were filled with fluid, which had a bubble of gas in it. Mr. H. C. Sorby, F.R.S., well known for his researches on the microscopic structure of crystals, had examined these, and shown that several gave a black cross with polarised light, indicating a want of pressure, as though the material surrounding the bubble had become somewhat solid and contracted, so producing a tension. The cloudiness in amber was due, therefore, to the intimate and irregular mixture of air or some gas, or even vacuities, with it; other examples of the same law of light were seen in pounded rock salt, or the powder of any transparent solid, clouds, condensed steam, foam, &c. Animi very rarely presented this appearance, nor was it probable that any amount of age would produce it. The greater number of these cavities were spherical, usually less than 1-1000th of an inch diameter, and sometimes occurred in waves, but occasionally some were met with more or less resembling in shape a balloon with car attached. The minute structure of these was described, and a comparison instituted with cavities in the diamond, quartz, mellite, and other mineral substances. Reference was then made to the organic remains, as insects, &c., found in amber, the action of chloroform on it described, and the paper concluded with the inference that amber had remained in a viscous state longer than recent resins, and that some specimens under different circumstances were in that condition much longer than others.

The paper was illustrated with several beautiful specimens of animi and amber, and with drawings by Mr. Ravis of some of the microscopic appearances. Mr. C. O. G. Napier also sent specimens of amber from Fezzan, in North Africa, where they were used as money, and also some picked up on the beach at Margate, which contained insects.

The President, in thanking Mr. Butler for his paper, and Mr. Ravis for reading it, observed that though the cause and nature of these cavities were obscure, he questioned whether they had any relation to the cavities and vacuities in quartz; similar ones were found in granite, and many of them contained water. He also explained that the submerged forests from which the Baltic amber was derived belonged to the Tertiary period.

Mr. Leipner believed, on various grounds, that the cars attached to the balloon-shaped cavities were probably vacuities—the spherical cavities containing a gas or fluid.

Mr. W. L. Carpenter spoke of the vacuities frequently met with in ice, as described by Prof. Tyndall, as well as the constant presence of air, which was entangled in it, rendering it opaque. He also called attention to the opacity in many specimens of ordinary resin, caused by the intimate mixture of turpentine, which could be expelled by heat, and the resin made clear. As little as 1 per cent. of turpentine, equally diffused through the mass, produced this effect.

Mr. W. W. Stoddart described the production of balloon-shaped cavities in Canada balsam (also a resin) when heated on a glass slide for mounting microscopic objects.

Mr. C. O. Groome Napier's paper on the Horse and Man, which was announced for this evening, was postponed till the April meeting, to enable the author to be present, and to read it himself.

WM. LANT CARPENTER,
Hon. Reporting Secretary.

BRISTOL

Naturalists' Society.

ESTABLISHED 1862.

REPORT OF THE COUNCIL,

READ AND ADOPTED AT THE

FOURTH ANNUAL MEETING

OF THE SOCIETY,

HELD MAY 3RD, 1866.

WITH

THE LIST OF OFFICERS, AND LIST OF MEMBERS.

BRISTOL:

GEO. MORRIS, PRINTER, 2, ST. STEPHEN'S AVENUE.

1866.

LIST OF OFFICERS,

AS APPOINTED AT THE ANNUAL MEETING, MAY 3RD, 1866.

President:

WILLIAM SANDERS, F.R.S., F.G.S.

Vice-Presidents:

REV. CANON MOSELEY, M.A., F.R.S., INSTIT. SC. PARIS CORRESP.

THOMAS PEASE, F.G.S.

Members of the Council:

STEPHEN BARTON.
F. V. JACQUES.
HERBERT THOMAS.
DAVID DAVIES, M.R.C.S.
WILLIAM POOLE KING.
ALFRED NOBLE, F.C.S.
JOHN BEDDOE, M.D.
CH. O. GROOM-NAPIER, F.G.S.
S. H. SWAYNE, M.R.C.S.

Treasurer:

W. W. STODDART, F.G.S.

Honorary Secretary:

ADOLPH LEIPNER, 26, Upper Park Street, Clifton.

Honorary Reporting Secretary:

WILLIAM LANT CARPENTER, B.A., B.Sc.,
2, Great George Street, Bristol.

SECTIONS.

ENTOMOLOGICAL.

President, S. BARTON. *Secretary,* GEO. HARDING, JUNR., Stapleton.

Second Tuesday in the month, at 8.0. P.M.

GEOLOGICAL.

President, W. SANDERS, F.R.S., F.G.S. *Secretary,* F. ASHMEAD, C.E., Alma Vale, Clifton.

Fourth Thursday in the month, 7.30. P.M.

BOTANICAL.

President, A. LEIPNER. *Secretary,* T. H. YABBICOM, 1, Spring Hill, King Square, Bristol.

Third Thursday in the month, 7.30 P.M.

CHEMICAL AND PHOTOGRAPHIC.

President, P. J. WORSLEY, B.A., F.C.S. *Secretary,* A. NOBLE, F.C.S., 6, William Street, Ashley Road, Bristol

Second Wednesday in the month, 8. P.M.

ZOOLOGICAL.

President, H. FRIPP, M.D. *Secretary,* S. H. SWAYNE, M.R.C.S., 8, Berkeley Square, Bristol.

Second Thursday in the month, 8.0. P.M.

In the summer months, many of the evening meetings are replaced by excursions.

All sections are open to any member of the Society, on payment of an annual subscription of 2s. 6d. in each case.

LIST OF MEMBERS.

Ashmead, Frederick, C.E.
Atchley, George F.
Austin, Major Thomas, F.G.S.
Baber, Clement
Badock, William F.
Baker, Septimus Valentine
Barber, J.
Barnes, Francis K.
Barton, John Perry
Barton, Stephen
Barton, W. H.
Bates, John
Beattie, John
Beddoe, John, M.D.
Beddoe, Richard C.
Benham, William, LL.D.
Bernard, Ralph M., F.R.C.S.
Bernard, Francis Ralph
Berry, William
Bisson, Francis P.
Blackmore, Jas. Chanter
Bolt, Henry
Bolt, John
Boorne, Charles
Braikenridge, Rev. G.W., M.A., F.L.S.
Brightman, Edward
Brittan, Alfred
Brittan, Frederick, M.D.
Browne, Samuel Woolcott
Budgett, John Payne
Budgett, W. Hill
Budgett, W. H.
Burder, George Forster, M.D.
Burleigh, Alfred, M.R.C.S.
Butler, Cephas
Caldicott, Rev. J. W., M.A.
Carpenter, Wm. L., B.A., B.Sc.
Carter, William G., M.D.
Cayzer, Thomas S.
Challacombe, J. P., M.D.
Chandler, John Moss, L.S.A.
Chandler, Joseph C.
Charbonnier, Henry
Charbonnier, Theodore
Clark, Thos. E., M.R.C.S.
Clark, William
Clarke, J. W.
Clarke, W. Michell, M.R.C.S.
Cole, T. C.
Colthurst, John, F.R.C.S,
Coomber, Thomas, F.C.S.
Cordeux, Frederick
Cossham, Handel, F.G.S.
Crichton, James M., L.R.C.S.
Dando, Charles
Davey, James George, M.D.

Davies, David, M.R.C.S.
Day, Alfred, LL.D.
Derham, James
Derham, Samuel
Desprez, Charles
Down, Edwin
Dunn, Charles Bortill
Evans, William
Exley, John T., M.A.
Fedden, William J.
Fegen, W. B., M.R.C.S., Surg. R.N.
Ferris, Henry
Fiddes, Walter
Fiddes, William
Fox, Charles Henry, M.D.
Fox, Charles Joseph, M.D.
Fox, Edward Long, M.D.
Fox, Edwin F., M.R.C.S.
Frayne, William
Fripp, Henry E., M.D.
Fry, Francis J.
Gale, Rev. I. Sadler
Garaway, J. R.
Gardiner, George, M.R.C.S.
Gardner, Charles E.
Gibbons, Edwin James
Giles, Richard William
Gillford, George
Girdlestone, Rev. Henry
Goodeve, Henry H., M.D.
Gotch, Rev. F. W., LL.D.
Gould, Joseph
Granville, J. Mortimer, L.R.C.P.
Greig, Charles, M.R.C.S.
Grundy, Thomas G.
Halsall, Edward
Harding, George, Jun.
Harding, T. G. Rice
Hare, John Strachey
Harris, Capt. Charles Poulett
Hartland, James
Harvey, Edward
Harvey, John, Jun.
Hawkins, Thomas, M.R.C.S.
Hayman, S.
Herapath, Wm. Bird, M.D.
Higgins, Edmund T., M.R.C.S.
Highett, Charles, M.R.C.P.
Highett, James, M.R.C.S.
Hill, Charles
Hodges, Edward R.
House, Henry
Howard, Thomas
Hudd, A. E.
Hudson, Charles T., M.A.
Husbands, Henry
Hutchins, J.
Jackson, John Pim
Jacques, F. V.
James, Christopher, C.E.
James, Rev. William
James, William
John, Evan
Johnson, Henry
Jordan, Henry K., F.G.S.
Kerslake, Thomas
King, William Poole
King, Mervyn
Kingdom, Edward J. J.
Kitt, Benjamin
Lang, Robert
Lansdown, F. Poole, M.R.C.S.
Leipner, Adolph
Little, Stephen
Lobb, Benjamin N.
Lunell, John E.
Malthus, Sydenham
Marshall, Henry, M.D.
Martin, Frederick
Martyn, Samuel, M.D.

Masters, Henry
Metford, Joseph S., M.R.C.S.
Miller, Alfred R.
Moore, John
Morgan, Frederick
Morris, George
Morris, J. W., F.L.S.
Moseley, Rev. Canon, M.A., F.R.S.
Moseley, H. N.
Mosely, A.
Naish, Louis
Napier, C. O. Groom, F.R.S., F.A.S.L.
Newton, H. J. W.
Noble, Alfred, F.C.S.
Nunn, E. C.
Ormerod, William, M.R.C.S.
Palmer, Henry Andrewes
Parker, George John, M.R.C.S.
Parker, George John, Jun.
Parson, Thomas Cooke
Parson, Thomas Cooke, Jun.
Parsons, James Gage, L.R.C.P.
Pass, Alfred C.
Pearce, William
Pease, Thomas, F.G.S.
Peck, William
Phillips, George
Plant, Edmund Carter
Pockson, William
Pocock, Rev. Nicholas
Polglase, William
Ponton, Archibald C.
Ponton, Thomas Graham
Pooley, Charles, M.D.
Pope, Thomas
Powell, Septimus
Poynton, Rev. F. J.
Præger, Emil Arnold
Prangley, Arthur
Prichard, Augustin, F.R.C.S.
Ranson, J. J.
Ravis, Charles F.
Roberts, Rev. H. Seymour, LL.D.
Rogers, John Robert
Sanders, John Naish, F.G.S.
Sanders, William, F.R.S., F.G.S.
Saunders, Joshua
Sawer, Thomas, M.R.C.S.
Seed, Frederick
Schacht, Frederick
Sheppard, William Y., M.R.C.S.
Sleeman, Philip R., F.R.C.S.
Smart, John S.
Smith, Alfred
Smith, Rev. Gilbert N.
Smith, William
Standerwick, Richard Sylvanus
Stansfeld, G. M.
Stephens, Gundry
Swayne, Joseph G., M.D.
Swayne, Samuel Hy., M.R.C.S.
Stoddart, W. W., F.G.S.
Tanner, Henry
Tanner, William
Terrell, William
Thomas, Charles
Thomas, Herbert
Thomas, Thomas
Tothill, William, Jun.
Townsend, Henry H.
Townsend, John Henry
Tubby, Major I. Hardy
Tuckett, Francis F.
Tucket, Phillip Debell
Turner, Thomas
Tylee, J. P.
Usher, Thomas
Vaughan, Philip Henry
Walcott, William B. L.
Walton, Thomas Todd

Warren, C. W.
Webster, Thomas, M.R.C.S.
West, E. F.
Weston, Andrew
Wethered, Joseph
Wheeler, Charles, Jun.
Wheeler, Edwin
Whitfeld, Fred. Henry
Whiting, Rev. W.
Whitwill, Mark
Wills, Frederick
Wills, Samuel
Wills, William Henry
Willway, H. P.
Wilson, Rev. George Martyn
Wilson, Henry, M.R.C.S.
Wollaston, Rev. W. C.
Woodward, Augustin
Worsley, Philip John, B.A., F.C.S.
Worsley, Samuel
Wright, Charles Edward
Yabbicom, Thomas Henry
Young, F. Graham

LIST OF CORRESPONDING MEMBERS.

George S. Brady, Esq., Sunderland.
James Buckman, Esq., F.L.S., F.G.S., F.S.A., &c.
William B. Carpenter, Esq., M.D., F.R.S., &c., University of London.
Philip P. Carpenter, Esq., B.A., Ph. D., Montreal.
Robert Etheridge, F.G.S., F.R.S.E., Mus. of Practical Geology, London.
J. P. Galienne, Esq., Guernsey.
Albert Günther, Esq., M.A., M.D., Ph.D., F.Z.S., British Museum.
T. Rupert Jones, Esq., F.G.S., Professor of Geology and Mineralogy, Royal Military College, Sandhurst.
Edwin Lankester, Esq., M.D., F.R.S., Kensington Museum, London.
Frederick Layard, Esq., late of Ceylon.
William Lonsdale, Esq., F.G.S., Bristol.
Charles Moore, Esq., F.G.S., Bath.
Hugh Owen, Esq., Paddington.
Professor John Phillips, M.A., LL.D., F.R.S., F.G.S., Oxford.
John A. Power, Esq., M.A. and L.M., Cantab.; M.R.C.P., Lond.; F.R.G.S., London.
H. J. Slack, Esq., F.G.S., London.
Rev. Frederick Smithe, M.A., F.G.S., Highley Vicarage.
Frederick Smith, Esq., British Museum.
G. H. K. Thwaites, Esq., F.R.S., Royal Botanic Gardens, Beradenia, Ceylon.

REPORT OF THE COUNCIL.

For the fourth time it devolves upon the Council of the Bristol Naturalists' Society, to present its Annual Report.

Four years of active operation, certainly affords ample proof and test of the powers and performances of a Society,—yet at the close of each year, your Council have had the satisfaction of finding abundant material whereon to base their Report, and of recording the favourable progress of the Society; nor are fair indications of its future activity wanting.

To set one's house in order at stated periods, is the wise regulation of all prudent householders; for the actual balance of gain or loss is best gathered from the accumulated transactions of the year, when a time has been set apart for *retrospect*, free from the heat and burden of the day. Such a regulation is even more necessary in the case of a literary or scientific association, than in ordinary affairs, whether private or public, inasmuch as it is not held together by any bond of external or internal exigency. A Society *cannot live on the inheritance of the past*; its existence depends on the *self-consciousness of present active powers*, rather than on the credit of past achievements. Hence it is that the retrospect which its Annual Report affords, is valuable in direct proportion to the assurance which it may give of *present usefulness*, and of *future promise*. With the fulfilment of these conditions such a retrospect may indeed offer every encouragement to perseverance, and the best guarantee of permanent prosperity.

The substantial benefit of a Report, can, however, only be attained by business-like simplicity of statement, and by moderation in its confidence. The prospects and promises which it holds out, must be broadly based on the community of interest and scientific order of the Members of the Society; for a Society *changes its complexion more rapidly than an individual, decay begins as soon as present activity fails, and its decay is followed by oblivion, even before it officially dissolves*. Every Society that pursues purely scientific aims, and that is dependent solely on voluntary effort, has of necessity a critical constitution and an uncertain vitality, and therefore is in constant need of extended and sustained support *from*

its whole body as well as from individual members. Your Council deem it an imperative duty to keep this important consideration always in mind, and to forewarn the Society against that inaction which is so perilous to its stability; whilst therefore they gladly report the improved character of the papers which have been read, and the higher interest of the discussions which have taken place, both in the general and sectional meetings, they yet venture to urge upon all and each of the Members, the importance of *active co-operation.* In the time of prosperity they yet feel it prudent, neither to slacken in their official duties, nor to omit such urgent persuasion as may be permitted to them in dwelling on the prospect of the future; fully recognising the actual progress made and looking hopefully forward, they call upon the Society to press on with *a long pull, a strong pull, and a pull altogether.* Fairly established in numbers, influence, and scientific position, the Bristol Naturalists' Society prospers; and whenever decay sets in, it will not be by default of those who stood its sponsors, or of those who first stood in the front array, but rather by the absence of willing recruits to fill the gap occasioned by lapse of time and exhaustion of the pioneers.

The time has not yet arrived, and ought not to arrive, when our Society may "*rest and be thankful.*" Let worthy labourers in quick succession extend the field of labour, and widen the aim and triumph of the Society. Let each individual effort stimulate to general action. Let united interest and sympathy encourage and stimulate individual exertion. Let us adopt the grand thought and words of our great poet—

Men my brothers, men the workers,
Ever working something new,
What they have done, but the earnest
Of the things which they shall do.

The present Report may be conveniently arranged under the following general heads—

I. Changes in the 'personel' of the Society.
II. Papers and discussions at the general and sectional meetings.
III. Excursions.
IV. Publication of proceedings.
V. Library.
VI. Finance.

I. Changes in the Personel of the Society.

The number of members remains the same as at the end of the last year—the list of newly-elected members balances our loss by resignation. We have to regret the loss of one corresponding member, and of three ordinary members, by decease. Two corresponding members have been elected during the year. Nearly the whole of the resignations of ordinary members have been occasioned by change of residence to a distance which renders their attendance at meetings impracticable.

II. Papers and Discussions.

The following tabular list shews, in a condensed form, the variety of subject matter which has been brought before the Society during the past year. We commence with the

General Meetings.

Name.	*Subject.*
Mr. Hugh Owen	Description and Habits of Periopthalmus Papilio.
" "	The Instability of Colour in the Feathers of Musophaga violacea.
Mr. Groom-Napier	The Attractive Qualities and Food of Birds.
Mr. Charles Ravis	On two Raised Beaches at Weston-super-Mare.
Mr. Henry K. Jordan (communicated by Mr. Stoddart)	On the Malacology of Venus Casina.
Mr. Henry K. Jordan	On the Rock-boring Mollusca.
Mr. Henry Brightman	On the application of the Photographic Printing Process for producing Copies of Botanical and other Specimens.
Dr. Henry Fripp	On the Vision of Fishes, and on certain Structural Peculiarities of the Fishes' Eye.
Mr. Wm. L. Carpenter	Note on Pharaoh's Serpents' Eggs.
" "	Note on the Artificial Formation of Flint.
Mr. W. W. Stoddart	On Involutina Liassica.
Rev. Gilbert N. Smith (communicated by Mr. T. Pease)	Recent Researches in a Bone-Cave near Tenby.
Mr. Philip J. Butler (communicated by Mr. Ravis)	On the Cloudiness of Amber.
Mr. Groom-Napier	The Horse and its Master.
Mr. Henry K. Jordan	Geological Considerations suggested by the Peculiar Molluscan Fauna living in the Littoral Zone of the Channel Isles.

It seems deserving of special mention that the papers of Mr. Owen and Mr. Butler were contributed by gentlemen who, though not ordinary members, have kindly manifested their interest in the Society's proceedings by direct personal communication; Mr. Owen, a corresponding member, having given himself the trouble of a long journey for the purpose, and Mr. Butler, by sending through our member, Mr. Ravis, a curious and valuable collection of specimens of amber for exhibition before the Society.

The several papers were listened to with much interest by a very numerous audience, and the discussions and information elicited were throughout of a very satisfactory nature. The Council note also with gratification the fact of a numerous attendance (including visitors, both ladies and gentlemen). The printed reports of each meeting, and of the discussions which followed the papers, render any further detailed notice in this place unnecessary. General meetings have been held monthly from October to April inclusive.

Sectional Meetings.

The *Geological Section* held eight meetings and undertook two excursions. Independent of minor communications, the following papers were read at the meetings of the Geological Section:—

Name.	*Subject.*
Mr. A. Leipner	On two species of Devonian Corals.
Mr. W. W. Stoddart	On Fossil Otoliths.
Mr. W. Sanders	On the Old Red Sandstone formation of Europe.
Mr. W. L. Carpenter	On Eozoon Canadense (a communication from Dr. W. B. Carpenter).
" "	On the Production of Artificial Silica.
Mr. W. W. Stoddart	On the Fossils of the Old Red Sandstone.
" "	On varieties of Ammonites Planorbis.
Mr. Groom-Napier	On a Fossil Skull of Rhinoceros tichorinus.

The excursions of the Geological Section comprised a survey of the cuttings on the Portishead Railway, and of those near Whitchurch, on the North Somerset Railway.

Chemical and Photographic Section.—The following papers were read at the meetings of this section.

Name.	*Subject.*
Mr. W. L. Carpenter	Notes on the Soap Bubble.
Rev. W. Whiting	On Effects of Polarised Light, illustrated by apparatus and specimens.

Mr. J. Beattie..........	On Photographic Lenses and Developing Processes.
Mr. W. L. Carpenter....	The Composition of Pharaoh's Serpents' Eggs.
Mr. A. Noble	Exhibition of large Paper Negatives by Mr. West.
Messrs. Worsley and Gillford.	On the Solubility of Chloride, Iodide, and Bromide of Silver in Hyposulphite of Soda.
Mr. J. R. Rogers	On Specific Heat.
Dr. Herapath Mr. W. L. Carpenter	On the Micro-spectroscope.

Zoological Section.—The papers read at the meetings of the Zoological Section were as follows :—

Name.	*Subject.*
Mr. E. A. Praeger......	On the Food of the Hedgehog, and its mode of Feeding.
Dr. Henry Fripp	Anatomy of the Eye of Cephalopoda.
" "	Exhibition of Preparations and Diagrams of the Retina and Lens of Loligo.
Mr. W. W. Stoddart	The Auditory Apparatus and Otoliths of various Invertebrata and Vertebrata.
Dr. Henry Fripp	Anatomy of the Choroid Gland of Fish.
Mr. Groom-Napier......	Communication from Mr. Tristram on the Birds of Palestine, with a collection of Nests and Eggs.
" "	Bones of the Dodo.
Mr. A. Leipner	On Asexual Reproduction of Larvæ of Cecidomydæ.
Mr. T. G. Ponton	Various Specimens exhibited before the meeting.

Entomological Section.—Four excursions were made by this Section, to Leigh Woods, Brockley, Nailsea Marshes, and Clevedon. Papers were read at the meetings by

Name.	*Subject.*
Mr. S. Barton..........	On two Species of Ceratorhina, and
" "	On the Coleoptera of St. Helena.
Mr. Geo. Harding jun.	On Eupithecia Lariciata, and
" "	On the Pterophorina of the Bristol District.

Many of the evening meetings were wholly or partially occupied by the exhibition and mutual interchange of specimens.

Botanical Section.—Excursions to various places, St. Anne's Wood, Portbury, Leigh Woods, Portishead, &c., occupied this Section during the summer months. At the winter meetings, subjects principally relating to vegetable physiology were discussed, those exciting most interest being

"Starch" and "Raphides." One feature worthy of particular notice in the transactions of this Section, is the preparation of a considerable number of plants for the Society's herbarium.

Besides the special business meetings of the several Sections, a general meeting for the financial account of each Section, and for the election of officers, has been regularly held, in accordance with the rules.

III. The Excursions of the General Society

Were three in number, namely, to Clevedon, Cheddar, and Dundry and Chew Magna. These excursions were well attended, and proved very successful, as well in respect to their scientific interest as to the cordial unanimity of feeling with which they were carried out.

IV. Publication of Proceedings.

Every member of the Society has received during the year, a printed copy of the Honorary Reporting Secretary's abstract of proceedings at the various excursions and meetings, in the order of their occurrence. And recently an enlarged and corrected Report published in pamphlet form, has been distributed in accordance with the minute of the general meeting of the Society, held on the 5th of April last. This report will be in future continued in the same regular form and type, and the Society may now be congratulated on having attained the great desideratum of regularly published proceedings. A still more important undertaking, the programme of which was given in the last annual report, and which was intended to come out in parts, demands a few words of explanation on account of the delay which has occurred in its issue. Considerable preparation has been made, and as the Council recognise at each step in this preparation the magnitude of the labour before them, it has been considered desirable to avoid any too hasty publication which might leave the work incomplete. The first number to be issued involves a complete reconsideration of certain debated questions of the geology of the neighbourhood, the settlement of which demands time and patience, and fresh investigation. The Council have also to take into consideration the financial prospects, upon which such a publication can be attempted.

V. Library.

In accordance with the expressed wish of several members, the formation of a library has been commenced. The sum of £13 6s. 6d. is now in the hands of the Treasurer. And the following list of books, partly

bought and partly received as donations, will show at a glance how the project stands at present.

Sowerby's English Botany, new issue. Vols. 1, 2, 3, 4.
Quarterly Journal of Science, from the commencement.
Intellectual Observer. Vols. 1 to 6.
Geological Magazine. Vol. 1.
British Land and Fresh Water Mollusca. Lovell Reeve.
Foramenifera, from the North Atlantic and Arctic Oceans. Jones and Parker.
On a new genus of Echinoderm, and observations on the genus Palaechinus. Major Austin.
Food, Use, and Beauty of British Birds. C. O. Groom-Napier.
Memoirs and Papers of Hugh E. Strickland.
Report of Dr. Benjamin Franklin, and other Commissioners, on Animal Magnetism. London, 1785.
Hortus Cantabridgiensis. James Down. 1815.
The Microscope made easy. Baker. London, 1769.
Botanical arrangement of all the Vegetables, naturally growing in Britain. Withering. 1776.
Brewster's Edinburgh Journal. Vols. 1, 2, 3.

The fund for the library depending entirely on the voluntary subscriptions of an inconsiderable number of the members of the Society, is at present but small, totally inadequate indeed for the desired purpose. The Council cannot omit this opportunity of recommending earnestly, a more efficient support from the whole body of members; and beg to remind the Society, that the use of the library is not confined to subscribing members only, but is offered to all.

VI. Finance.

From the statement of Receipt and Expenditure, which will be read by your Treasurer, it will be seen that the balance, as compared with that of last year, is not so large as formerly, but still, however, on the *right side* of the balance sheet. The arrears of subscriptions, though less than in past years, shew to the Society's disadvantage, notwithstanding the employment of a paid collector. Amongst the items of expenditure placed in the present account, are 19 guineas paid in part as a donation of money to the Institution, and in part for a collection of fossils presented to the Museum. Also an extra expenditure of nearly £9 for reprinting abstracts of papers and proceedings of the Society, since January of the present year. A further item of expenditure appears for lamps, purchased

for the use of the Sections during the winter meetings, which remain as the property of the general Society. These several items serve to explain the diminution of balance. The printing expenses for the future must necessarily correspond with the improved style of publication of report, but the Council hope to lessen this expenditure by admitting advertisements on the wrapper.

Having passed in review the principal points which appear to call for notice, your Council feel justified in characterising the action and position of the Bristol Naturalists' Society, as thoroughly sound and efficient, and as well calculated to reassure and encourage those who may not be equally conversant with its steady developement. Your Council also confidently trust in the strength and vitality of an Association, which numbers amongst its members so many accurate observers and active contributors. In conclusion they beg to congratulate the Society on the position it has attained, and on the prospects before it.

"FLOREAT SEMPER."

Dr. W. W. Stoddart, *in Account with* The Bristol Naturalists' Society. Cr.

Dr.

Date		£	s.	d.
1866.				
	To Balance in Treasurer's hands ..	46	11	11
April 30.	To Subscriptions received to this date	54	0	0
		£100	11	11
	To Balance in hand	15	0	2
	To Arrears	15	15	0

Audited and found correct,
THOMAS TURNER,
May 1st, 1866. EDWIN J. GIBBONS.

Cr.

Date		£	s.	d.
1865.				
June 15.	By Cash—Donation to Institution ..	15	0	0
Aug. 12.	" Somerton & Co., ...	4	15	6
Oct. 5.	" Fossils for Institution ..	4	19	0
1866.				
Jan. 18.	" Somerton & Co.	4	0	6
Feb. 8.	" Mardon & Co.	13	6	6
April 24.	" Morris	1	18	0
"	" Baker	0	10	0
"	" Sturge	4	12	9
"	" Mardon & Co.	3	17	0
"	" Collector's per centage .	3	4	6
"	" Gratuities, Notices, &c., per Secretary, and sundry Expenses ..	22	8	0
April 30.	" Morris	7	0	0
"	" Balance in hand	15	0	2
		£100	11	11

LIBRARY FUND.

Dr.

Date		£	s.	d.
1866.	To Balance brought forward ..	11	5	0
April 30.	To Subscriptions recd. to this date	10	10	0
		£21	15	0
	To Balance	13	6	6

Cr.

Date		£	s.	d.
1866.				
Feb. 8.	By Cash Quarterly Journal of Science ..	1	0	0
March 14.	" Sowerby's British Botany ..	7	8	6
	By Balance	13	6	6
		£21	15	0

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

MAY, 1866.

ANNUAL MEETING.

Thursday, May 3.—Mr. W. Sanders, F.R.S., F.G.S., President, in the chair.

The President, in opening the business of the meeting, remarked that the number present was almost as small as at the annual meetings of the Institution. It was generally the case in an old established society, if there were no circumstances of interest to draw members together, they assumed that everything was going on smoothly, and that the business would go on just as well without them as with them, and they would know the proceedings after the meeting was over. He had always found at the Institution meetings, that unless there were some question of importance to be decided, or some heavy complaint to be made against the committee, very few attended; all seemed satisfied—so far satisfied as to stay away, and leave the business to be done by those who were kind enough to attend.

The Hon. Secretary then read the minutes of the last annual meeting, and also of the general meeting held in April. He announced that the following gentlemen had been duly elected ordinary members:—W. H. Budgett, Gundry Stephens, Charles Wheeler, jun., Edwin Wheeler, Henry House, and J. Hutchins. He then read the report of the Council, for which see page 36.

Mr. W. W. Stoddart, Hon. Treasurer, read the audited accounts, for which see page 44, after which he expressed his regret that their balance was getting less. The arrears of subscriptions amounted to £15 15s. The balance in hand would not carry the Society through till next January, and it would be a great pity if the bills were not paid until the subscriptions came in, because that would entrench on next year's funds. Of course the expenses had been slightly increased, and he thought their subscriptions ought to be slightly increased also. A trifle would do. They already paid 5s., and each member cost that, and how were their expenses to be met if such was the case? He thought it was not unreasonable to

submit to-night what had occurred to him in making up his report, viz., that the subscription should be 7s. 6d., instead of 5s., and if it was agreeable to the meeting, he would willingly undertake the little extra trouble of collecting another half-crown. This would place them on a firm basis, and enable them to work with a will. Another suggestion he had to make was that the financial year should in future correspond with the Society's year. This would be especially necessary were he to give up the office of treasurer, because the accounts would be very complicated to a new treasurer, and the change could be very simply effected. If they all gave another half-crown, it would carry them on till next May very nicely, and thenceforward had another subscription of 7s. 6d., they would have means without interfering with the accounts at all, after which the treasurer's financial year could be from May to May, the same as the Society's year. The policy of this course must be palpable to all, and he regretted there were not more present to hear his remarks, as he should wish the change to be made in deference to a general opinion and not to the opinion of a few. If agreeable to the members generally that the half-crown should be collected at once, they would have the satisfaction of knowing that everything would be conducted—economically, of course—without the slightest source of uneasiness.

Mr. C. F. Ravis then moved the following resolution:—"That the report now read, together with the Treasurer's account, be approved, and printed under the direction of the Council, and that a list of the officers and members of the Society be added thereto." Mr. Ravis regretted that so few members had heard the report read, because it came with more freshness and power to the mind when read in an assembly. The Society had all the elements of success in it—several guides and pioneers, men of high attainments in science—others of more moderate capacities, but still able to do good work, and also those, probably many, who thought they knew and could do but little, but who, he was persuaded, knew much more than they thought, and could do much more than they thought. If all worked together, as was suggested in the report, the Society would go on and prosper. The speaker then pointed out how advantageously the Society was situated in respect of materials for work, and remarked that their object was by no means attained by the mere collection and naming of specimens; the great aim was the improvement of their own intellectual capacities and powers.

Mr. R. S. Standerwick seconded the resolution, which was adopted unanimously.

Mr. Henry K. Jordan, F.G.S., proposed "That a contribution of ten guineas from the surplus funds in the Treasurer's hands, be presented to the Institution; that the Honorary Secretary be requested at the same time to convey the best thanks of the Naturalists' Society for the kindness with which they have been met by the Committee of the Institution." He

believed that the amount proposed to be given this year was not so large as last year. There had been several causes which had brought about this result. Mr. Stoddart had told them that they had considerably increased their expenses, while their income had not materially increased, consequently they had a smaller balance than last year. They did not, however, at all intend that the ten guineas should mark their full appreciation of the kindness the officers of the Institution had shown them, but rather as a small token of their gratitude.

Mr. BERRY seconded the motion, which was unanimously adopted.

Mr. S. H. SWAYNE then proposed the following resolution:—"That the Hon. Treasurer, the Hon. Secretary, and the Hon. Reporting Secretary be requested to continue in their respective offices during the ensuing year." Mr. Swayne said he had much pleasure in moving this resolution, and not the less so because he felt the Society generally would entirely support it. Each of those gentlemen had done such good work for the Society that there could not be two opinions on this resolution. He was sure they would all agree that the reports of the Society had been exceedingly well edited, and the very excellent report the Council had just given them, showed that the Council had a very able member, and one capable of putting out a report in a manner that reflected great credit on the body of which he formed a part. The Society was also greatly indebted to the Treasurer for the amount of work which had fallen to his lot, as must be apparent from the report. That the general business of the Society, of which the Secretary had the management, was of an extremely onerous character, must be plain to all, and that it had been carried out in a way to give very great satisfaction to the members of the Society, must be equally clear. He thought, therefore, there could be but one opinion as to this resolution being carried by acclamation.

Major AUSTIN seconded the resolution with great cordiality.

Mr. H. K. JORDAN wished to make one or two short remarks. After expressing his agreement with what had fallen from the Mr. Swayne, he thanked all the officers for the time they devoted to the Society. No men valued time so much as scientific gentlemen, and when they saw those gentlemen coming forward and devoting a great deal of time to the Society, they must feel that they made considerable sacrifices, and that their best thanks were due to them.

The resolution was put to the meeting, and carried by acclamation.

The PRESIDENT said their next duty was to elect their future President, and perhaps he should have an opportunity presently of saying a few words, before he left the chair and yielded it up to whoever they should be pleased to elect.

The ballot was then taken for the election of President, and it was announced that Mr. W. Sanders had been unanimously re-elected.

The PRESIDENT, in acknowledging the compliment, begged them to

believe that he felt very grateful for the honour they had conferred on him. It was an honour to which every one in the Society might fairly aspire, and be glad to attain; it was an honour very gratifying to him, and it involved duties which were very agreeable at the same time, viz., to attend the meetings regularly, to be the organ of returning thanks to the contributors, and to preserve order at the meetings. He would ask the younger members of the Society to observe this circumstance, and to perceive that one with no pretensions to high scientific attainments or great intellectual powers, was nevertheless recognised, because during a long career he had endeavoured to promote every scientific object going on in the city, and had encouraged every scientific Society that had been established. He had met with his reward, and he acknowledged it, and would remind any of the younger members of the Society, that though they had no higher attainments than the present President, yet that if they worked on diligently and constantly with a view to be useful, and to promote science, the time would come when they would certainly receive the same reward as he now received.

The ballot was next taken for two Vice-Presidents, which resulted in the re-election of the Rev. Canon Moseley and Mr. T. Pease; and Dr. Beddoe, Mr. S. H. Swayne, and Mr. C. O. Groom-Napier were elected to fill the vacancies in the Council caused by the retirement of three members, in accordance with Rule III. of the Society.

Mr. C. O. Groom-Napier then submitted the following resolution: "That the thanks of the Society are due to its officers, and the members of the Council, for their management of the Society's affairs." It appeared to him, he said, that his resolution had been partly included in the one moved by Mr. Swayne. But he thought the Society would feel with him that their thanks were doubly due to those who had so well discharged the affairs of the Society, and also to the Council for their attendance, attention, and management. He could only cordially express feelings similar to those of Mr. Jordan and Mr. Swayne, in regard to the great services which the officers and members of the Council had performed for the good of the Society (hear, hear).

Major Tubby seconded the motion, and it was most cordially accepted by the meeting.

The President said the officers of the Society had really done the hard work. Two of them were present, and ought certainly to be expected to acknowledge the vote. But perhaps they might prefer that he, as President of the Society, should return thanks on their behalf, and that would enable him to pass over any part of the compliment that belonged to him, entirely to them. He therefore thanked them on their behalf, and wished to say that thanks were really due to them.

Mr. A. Leipner, Hon. Sec., wished to say a word or two in reference to the vote of thanks that had been so kindly passed to the officers of the Society. He might say that it had been a source of very great encourage-

ment to him, and no doubt to his fellow officers, that their endeavours to promote the interests of the Society had been so well and so kindly received. He could assure them he would not fail, so long as he continued to hold the office of Hon. Secretary, to forward the interests of the Society to the utmost of his power. He had one source of uneasiness, that he was heavily pressed for time, and that he could not devote so much time as he should like, and had done in years past, to the affairs of the Society. The members of the Council, however, and his brother officers, had tried to ease the burden falling on him individually, and on that ground the excursions would be managed, not as hitherto, by the Hon. Secretary, but by a deputation from the Council, for the time they took up was more than he could devote from his own private affairs. The excursions for this year had not been completely fixed, but in the Council the following had been spoken of—to Penarth, near Cardiff; Charfield, near Gloucester; and May Hill; neither had it been determined which would be first, or on what day. These matters must be settled by the gentlemen who would have to undertake the management of the excursions, and who had not yet been appointed. He hoped the excursions would be as pleasant as they were last year, and as numerously attended. His experience had been that the most distant excursions were usually the best attended.

Mr. W. W. Stoddart, Hon. Treasurer, also acknowledged the vote of thanks, and hoped the Society would sustain him in his efforts to make both ends meet, by agreeing to the proposition he had made.

Mr. S. H. Swayne said that although their thanks had been voted to the officers generally, he felt that one duty remained, and that was to thank the President personally. He was quite sure it would not be fair for them to separate without thanking the President, for the very perfect manner, he might say, in which the affairs of the Society had been presided over by him, and he was sure he only expressed the general feeling of the Society, when he said that he hoped it might be a very long time before they should have to choose another President.

Major Austin most cordially seconded the proposition, and it was carried by acclamation.

The President said he felt very grateful to them. The constant courtesy he had received was very gratifying, and had enabled him to conduct the business of the meetings with great pleasure to himself, and so long as that mutual kindly feeling continued, no doubt their meetings would always be agreeable to each other. Therefore he accepted the vote with thankfulness, and was very much obliged to the proposer and seconder, and to the meeting for adopting it so kindly.

MEETINGS OF SECTIONS.

BOTANICAL SECTION.

Thursday, April 26.—The first walk of this season was taken to explore the neighbourhood of that portion of the river Froome between the two bridges at Stapleton. In consequence of the lateness of the season, however, but few plants of interest were found, those that were, being such as are commonly met with in similar localities, as the Anemone nemorosa, Hyacinthus non-scriptus, and an abundance of Allium ursinum. Some plants of Ranunculus ficaria, growing at the water's edge, were remarkable for the size and abundance of their showy flowers, and a few fine specimens of Myosotis arvensis were picked. In the spring near the second bridge was found a species of Fontinalis, also a quantity of Diatoms, chiefly species of Navicula and Pleurosigma.

GEOLOGICAL SECTION.

Friday, April 27.—Mr. W. Sanders, F.R.S., F.G.S., President of the section, in the chair.

Mr. C. O. Groom-Napier exhibited a skull of Rhinoceros tichorinus, found in Eastern Siberia, lat. 71°, 1000 versts east of Ural, in tertiary strata very rich in hæmatite, in 1861. When making some excavations for this ore, some bones of the Bear were first found, and some fathoms below the surface, in a loose friable sandstone, this skull was discovered. It was 2 feet 9 inches long, and 14 inches wide, having seven teeth in situ, and it was believed that this was the only adult specimen with so large a number of teeth. A photograph was shown of the most perfect specimen known, but young, and only 2 feet in length.

Mr. W. W. Stoddart exhibited a very remarkable specimen of a fossil (coral ?) which had also been noticed by Mr. Leipner, as occurring in the Black Rock Quarry. It most nearly resembled Amplexus, when cursorily examined, but really differed in its internal structure, so as to be totally distinct. Mr. Stoddart also exhibited two specimens which had been very kindly lent by Mr. Lonsdale, and which greatly helped towards a correct study of the anatomical characters. He said that if on further examination it should prove to be a true coral, it must be referred to an entirely new genus of Zoantharian zoophytes.

The discussion on the above communications having occupied nearly the whole of the evening, Mr. Sanders's paper on "Fossil Fishes," was again postponed.

ENTOMOLOGICAL SECTION.

The first excursion of the above Section took place on Monday, May 7, to Leigh Woods, the members meeting at 3.30 p.m., at the Suspension Bridge. The day was all that could be desired, and a number of species

were observed and taken, especially of Coleoptera. The following were some of the principal species captured :—Scaphidium Quadrimaculatum, about a dozen specimens of this pretty and uncommon species were taken under fungus on dead birch trees; Byphillus lunatus, in fungus on dead ash; Pollydrosus micans, P. cervinus, and Orchestes ilicis, by sweeping and beating birch; besides a number of species of more common occurrence. Lepidoptera were not so abundant as the Coleoptera, and but few species were captured, the principal being—Geometra papilionaria, larva from birch; Tephrosia punctulata; and several species of Tineina and Tortricina.

It was determined that the weekly meetings for collecting should be as follows :—Saturday, May 12, to the Beech Wood, Stapleton, members to meet at Ashley-hill Station, at 6.30 p.m. Thursday, May 17, Boiling Wells, to meet at the Mill, at 6.30 p.m. Thursday, May 24, Bedminster Marshes, to meet at Bedminster Bridge, at 6.30 p.m.

The next monthly excursion of the section was arranged to take place on June 4th, to Brockley. Members to meet at the Bristol and Exeter Railway station to proceed by the 1.45 p.m. train.

ZOOLOGICAL SECTION.

FRIDAY, MAY 11.—Mr. W. SANDERS, F.R.S., in the chair.

The Secretary of the Section, Mr. S. H. Swayne, exhibited two specimens received by him in a letter from Windsor, Sydney, Australia, of "soldier and sailor" Ants, of large size, and possessing very powerful jaws. Mr. Swayne had not yet succeeded in obtaining their specific names. He also showed some of the flat under-shells of Placuna placenta, a species of oyster, which, after being thinned by splitting, were used in Manilla and China as substitutes for window glass.

Mr. GROOM-NAPIER, F.G.S., F.A.S.L., then read a paper on the "Reptiles mentioned in the Bible." He referred to his former paper on "Birds of Palestine and those mentioned in Scripture," and said he had given much attention for some years to the natural objects mentioned in the sacred writings. The frogs that plagued the Egyptians he believed to be the Rana esculenta, or green frogs, so much eaten in France. He said four distinct Hebrew words were translated by the word Adder in the Old Testament, which he treated separately. Some were identified by the derivation of the Hebrew name, signifying some characteristic by which the reptile was recognised. One of the four was probably the Egyptian Cobra, another the Cockatrice, and a third the Cerastes Haselquisti, which the author considered to be also referred to as a "fiery serpent"—Numbers xxi. 6-8. This snake coiled itself up, hiding its head in the sand, and frequently bit the legs of travellers' horses. Mr. Napier then referred to several other reptiles—the leviathan, probably the crocodile,—the lizard,

Lev. xi. 30, probably the Pterodactyle gecko, or "fan-foot," common in Egypt, but widely distributed. The Chameleon of the same passage he thought was the Monitor Niloticus, and the snail the true Chameleon Africanus, found in Syria and Egypt. The snail "which melteth," Psl. lviii. 8, he thought referred to a slug which gradually consumed its substance as it crawled, and left its slime behind. He said that he was glad to have the opportunity of calling attention to the fine collection of reptiles in the museum of the Institution, which so well illustrated his paper; and said he hoped that they would be often made available for similar purposes.

CHEMICAL AND PHOTOGRAPHIC SECTION.

Wednesday, May 16 (postponed from May 9th).—The section adjourned to the meeting of the Microscopical Society, in order to hear an address from Mr. H. C. Sorby, F.R.S., on his researches with the Micro-spectroscope. Mr. C. T. Hudson, M.A., LL.D., President of the Microscopical Society, occupied the chair. Mr. Sorby characterised the investigations of the absorption bands produced in the spectrum by various coloured solutions, as a more refined mode of recognising substances by their color, and described at some length the construction of the 'direct-vision' spectroscope now applied to the microscope, the arrangements for comparing two spectra together simultaneously by an ingenious arrangement of reflecting prisms, and his mode of examining the spectra of coloured solutions, crystals, and other substances. He dwelt upon the spectra of blood, fresh, old, and when submitted to the action of various chemical reagents, pointing out that no other red colouring matter with which he was acquainted—and he had examined all he could think of—behaved in this way, so that the test was very reliable, as well as delicate, $\frac{1}{100}$th grain being detected with perfect ease, and even $\frac{1}{1000}$th grain with care. The testing of cloth and various fabrics for blood stains was comparatively easy, but in examining stains on leather, the tannic acid interfered to some extent. Mr. Sorby then mentioned several curious facts that he had made out in the course of his investigations. The same substance frequently gave a different spectrum when in the solid state and in solution, and even then the position of the bands often varied with the solvent. Different salts of the same metal sometimes gave different spectra, as in the case of nitrate and acetate of uranium. Alum in solution had a remarkable effect in intensifying the colouring power and action on the spectrum, of many substances. The act of solution upon a double salt produced an effect from which it was inferred, on optical grounds only, that the salt was decomposed. Mr. Sorby exhibited a small micro-spectroscope, which displayed several spectra very beautifully, and which was very easy of manipulation; and Dr. W. B. Herapath showed Mr. Browning's eye-piece direct-vision spectroscope, adapted to his large instrument.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

JUNE, 1866.

GENERAL EXCURSION.

TUESDAY, JUNE 12TH.—The first excursion for this season took place this day, to the neighbourhood of Charfield. Owing to the early part of the day being very wet, several were prevented from attending who had taken tickets, and the number of the party was smaller than usual, but those who had sufficient faith in the weather to set forth, were rewarded by a tolerably fine day, no rain falling until the excursion was over.

The members and their friends left Bristol by the 11.10 a.m., Midland train, and on their arrival at Charfield station, the principal geological features of the surrounding country, as well as the proposed route, were explained by the President, Mr. W. Sanders, F.R.S., F.G.S., with the aid of his very accurate geological map of the district. A good example of greenstone trap, coming up through the Silurian beds, in a field close to the railway, beyond the station, was first visited, and Mr. Sanders drew the attention of members to the vescicular structure of the igneous trap rock, easily breaking in any direction, and therefore unfit for almost any practical purpose, except road-mending, as contrasted with the regular structure of a rock deposited by water, the "joints" of which were taken advantage of by quarrymen in obtaining stones for building and paving. In crossing the fields, the botanists obtained some very fine specimens of Conia maculatum, and later in the day the Digitalis was observed in flower, very early for the season. Avering Green was next visited, where commences a remarkable ridge of trap-rock, which is about three quarters of a mile long; pursuing this for a short distance, the party followed a footpath and lane to Damory Bridge, where a quarry of very siliceous igneous rock was examined, which on a former occasion had yielded specimens of the rare mineral prehnite. On the hill above this, an ancient encampment was visited, whence a fine view of the surrounding country was enjoyed. The rock at the sides of the lanes in this neighbourhood

was carefully searched by the geologists of the party, under the guidance of Mr. W. W. Stoddart, F.G.S., who reported that among other fossils characteristic of the Upper Llandovery beds, the following were found, more or less abundantly: Holopella obsoleta, Atrypa hemispherica, stems of Glyptocrinus, Cornulites serpularius, Tentaculites Anglicus, Rhaphistoma lenticulare, Encrinurus, Phacops Stokesii, with many other Trilobites, and the usual Rhynchonella nucula, associated with the common Upper Llandovery Brachiopods, altogether making a very rich collection of fossils, considering the shortness of the time devoted to obtaining them. During the search for fossils, many of the party walked to Old Tortworth Court, and examined the remarkable chestnut-tree in the orchard attached to it. This tree is mentioned in many Botanical works as an example of the age of trees, a document in the reign of Stephen containing a reference to it as even then (12th century) an old tree. The interior of the trunk is much decayed, and the lower branches rest more or less upon the ground. The geologists having rejoined the party, Mr. Sanders pointed out the conglomerate in the Old Red Sandstone of the neighbouring hill, and the whole party proceeded to the grounds of new Tortworth Court, where, by the kind permission of Earl Ducie, most readily granted in answer to the request of the President, they inspected the hothouses and conservatories belonging to the mansion, under the able and obliging guidance of the head-gardener, Mr. Cramb, to whom the members were much indebted for the information so readily and courteously afforded them. In walking through the grounds, he pointed out a spot near the house, where the lowest beds of the mountain limestone were seen, most of the strata in the immediate neighbourhood being Devonian.

After spending a short time very pleasantly in the grounds of the Court, the members walked back to Charfield by the high road, and having, as usual, dined together, on this occasion very comfortably at the inn close to the station, they returned to Bristol by the 6.30 p.m. train.

MEETINGS OF SECTIONS.

GEOLOGICAL SECTION.

Friday, May 18.—First walk of the Season, to Aust Cliff.

The members left Bristol by train at 2.40 p.m., and after a pleasant walk from the New Passage, commenced the examination of the beds at the S.W. end of the Cliff, and as a large mass of the rocks had lately fallen at that place, a good series of fossils, characteristic of the Rhœtic or Avicula contorta zone, were obtained in an exceedingly perfect state.

Among those collected were Pecten Valoniensis, Avicula Contorta, several species of Axinus and Anatina, Cardium Rhœticum, &c., the Pectens and Cardiums being especially good. It was remarked that the Natica Oppelii, which is so common in the rest of the district, was comparatively rare in the Aust beds.

The Cotham marble, lying just above the Avicula limestone, was the next object of examination, and from it were collected scales and teeth of fishes (Dapedius and Pholidophorus.) With these occurred an abundance of the elegant Entomostracon, Estheria minuta, so long regarded as a bivalved mollusc. As very little of the well known "bone-bed" had fallen, only a few of the fish-remains fell to the lot of the collectors, but one good tooth of the curious Ceratodus gibbus, and a few portions of spines of Hybodus were taken, the source of supply being entirely dependent on falls from the upper part of the Cliff.

Before leaving, Mr. Stoddart directed the attention of the members to the instructive examples of "Faults" which occur in the Cliff. The nearly horizontal beds of limestone are so well marked by difference of colour, that the fracture and subsidence of the beds are plainly apparent. From each of these Faults flows a small quantity of water, which percolating through the strata, finds a vent and trickles down the face of the rocks. Here those interested in microscopy, made a rich harvest of a singular stalked diatom Cocconema Cymbiforme, which here grows in great profusion.

The members walked back to the New Passage Hotel, and after a capital tea, returned to Bristol by an early train, having thoroughly enjoyed a very pleasant and instructive ramble.

ENTOMOLOGICAL SECTION.

Monday, June 4.—The second excursion of the Section took place to Goblin Coombe, near Brockley.

The members proceeded by 1.45 p.m. train to Yatton, walking from thence to the Coombe, and as the attendance was good, and the day every thing that could be desired, a large number of species were observed and captured. Among the species of Lepidoptera taken, were

Vanessa C-Album. The specimen of this insect taken had evidently hybernated from last autumn.

L. Argiolus, common round holly.

Thecla Rubi.

B. Neustra, larva abundant on white thorn.

L. Quercifolia, larva.

E. Lariciata, imago on boles of larch.

E. Indigata, on boles of larch.

M. Liturata, F. Piniaria, and T. Variata, being very abundant among fir trees.

Among the species of Coleoptera taken, may be enumerated

Leptura Melanura.

Cryptocephalus lineola.

Cocinella ocellata.

" oblong-punctata.

Cistela castanea.

Phyllobius calcarotus,

besides a large number of more abundant species. The captures were not altogether confined to Entomology, as Listera Nidus-avis was found growing at the foot of an oak tree, and two specimens of the viper were seen, one of which was disabled by a blow from a stick, and duly boxed to accompany the members back to Bristol.

CHEMICAL AND PHOTOGRAPHIC SECTION.

WEDNESDAY, JUNE 13.—Mr. P. J. WORSLEY, F.C.S., President, in the chair.

Mr. WILLIAM JAMES exhibited some negatives which had been intensified by a solution of persulphate of uranium, mixed with ferricyanide of potassium. They were of a crimson colour, and the increased intensity, which was well shown in the prints taken from them, was apparently due to an alteration merely in the condition of the deposit, and not to an addition to it, as was the case when most of the intensifiers in ordinary use were employed. On this account, this new preparation was considered preferable.

Dr. W. B. HERAPATH gave an account of an examination of various precious stones with the micro-spectroscope, undertaken with the view of finding out whether by this means, imitation gems could be distinguished from real. Sapphires of a deep blue could be distinguished from the cobalt blue glass, but with pale blue stones there was no perceptible difference in the bands. It was very easy to decide between a garnet and red glass, the latter cutting off nearly all the spectrum beyond the orange, while the real gem produced three decided bands, two in the green, one in the yellow. Most yellow and orange stones gave no bands, nor did the emerald, nor the amethyst. The imitation of the spinel ruby was very successful, producing an absorption band in the green, as did also the gem itself, which was of a pale pink color.

The gentleman who was to have read a paper on Pouncey's Carbon-printing process, having failed to keep his engagement, the Section shortly afterwards adjourned until the second Wednesday in September.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

JULY & AUGUST, 1866.

GENERAL EXCURSION.

FRIDAY, AUGUST 24TH.—The excursion arranged for July 10th, not having been carried out, in consequence of an insufficient number of tickets having been taken, the same took place on this day, and was fairly attended by members and their friends, as well as by several ladies. As the weather was exceedingly fine, and the arrangements well carried out, a very enjoyable day was the result.

The party, including the President, Mr. W. SANDERS, F.R.S., F.G.S., and one of the Vice-Presidents, Rev. Canon MOSELEY, F.R.S., left Bristol at 11.10 a.m., by rail to Charfield, whence they were conveyed in vehicles to Wotton-under-Edge. At Charfield the Lower Silurian beds were passed over, then for about half-a-mile, the New Red Sandstone, and afterwards the Lower Lias. On ascending the hill, the marlstone was observed, which continued to Wotton, and part of the way up the hill behind the town; but soon after passing the turnpike the lower beds of the Upper Lias Sands were seen, and a quarry was investigated, which displayed very clearly the junction of the uppermost beds of the Lias with the Inferior Oolite. The President remarked that the steep hill opposite the railway station at Bath was composed of the same series of beds, and pointed out Ammonites serpentinus as the characteristic fossil. Here were obtained also, specimens of Greslya, Ceromya, Trigonia costata (a recent species of which genus, as of some other Oolitic fossils, has lately been found in Australia), Myacites, Panopæa, Terebratula perovalis, Pholadomya fidicula, and several Belemnites. The so-called Iron-shot bed attracted much attention, and was considered to be a mixture of silicate of iron and hydrated oxide of iron. Referring to the Ammonites, and some other spiral shells, Canon MOSELEY explained that their growth in these shapes took place in accordance with known mathematical laws, some of which he had investigated.

The next quarry visited displayed entirely the Inferior Oolite, of which the whole range of hills to Nibley was composed. The PRESIDENT remarked that these strata had been deposited in very deep water, as was inferred from their great regularity, and from the paucity of animal remains, these being found most abundantly in beds deposited near the sea shore. At different spots along the hill, however, several beautiful specimens of Rhynchonella spinosa were obtained, also Lima pectiniformis, several species of Terebratula, including T. maxillata, and some beautifully preserved small pectens (two species). Growing abundantly in the neighbourhood of the Inferior Oolite quarry, the botanists of the party found, amongst other plants, Echium vulgare, Reseda luteola, Gentiana Amarella, Campanula glomerata, and Chlora perfoliata.

The party then strolled quietly through the woods on the brow of the hill, stopping frequently to admire the glorious and everchanging views over the landscape, and arrived at the monument now in course of erection on Nibley-hill, to the memory of Tyndall, so celebrated in connection with the Holy Bible, who formerly lived in the neighbourhood. This was carefully inspected, and several of the party mounted to near the top, in order to enjoy the more distant view gained by the increased elevation. It was seen that the rough inside work was built of the stone from the hill, but that the steps of the tower were of Nailsworth stone, also Inferior Oolite, but harder, while the whole of the outside was faced with Bath freestone. Through the kindness of the clerk of the works, the designs for the completion of the monument were inspected.

In the Wood, the following species of plants were gathered: Ononis campestris, Eupatorium cannabinum, Campanula latifolia, and Hypericum androsaemum. A quarry in the hill just above Nibley, yielded some beautiful small pectens, and on decending the hill, the fossils of the Upper Lias Sands were again seen, including, in addition to the list previously given, Modiola Sowerbyi.

At the foot of the hill, conveyances were in readiness to carry the party back to Charfield, where they did justice to the dinner that awaited them, after which the PRESIDENT rose, and, first observing that it was against the rules of the Society to propose any toast after dinner, expressed the pleasure he felt in seeing so large a proportion of ladies present, and then congratulated the members on the advantage of the presence with them that day of one of their Vice-Presidents, Canon Moseley, suggesting that he would perhaps address a few words to them.

Canon MOSELEY, being thus called upon, rose and thanked the President for the allusions made to him. He expressed his firm belief in the advantages of a scientific education, a belief which was increased by meetings such as the present. Science had for its object the pursuit of Truth, and Truth, he said, was a thing of God, who would take care of it; it was impossible that an increase in scientific knowledge should diminish

devotion to the Creator. The speaker then adverted to the division of the Sciences into the exact, the experimental, and the observational, remarking that he considered the sciences of observation most worthy of general cultivation—though he was personally devoted to the exact sciences—because they could be pursued, as had been done that day, in the open air—where all the senses were delighted at once, and God was more visibly present. The Canon concluded by congratulating the Society on the adoption of this department of science, and expressing his earnest hopes for its successful continuance.

Shortly after rising from table, the members adjourned to the Railway station, and took the evening train to Bristol, after one of the most pleasant and least fatiguing excursions ever undertaken by the Society.

MEETINGS OF SECTIONS.

BOTANICAL SECTION

Wednesday, June 27.—The members of this Section met at the Bath Bridge, for the purpose of investigating the east end of St. Ann's Wood, Brislington, one of last year's walks having been taken through the lower portion. Upon entering the valley, the eye was struck with the fertility of the vegetation, and the picturesque beauty of the scene. Scattered among the banks were the faintly smelling flowers of Valeriana officinalis, amid gigantic specimens of Heracleum sphondylium, while here and there were seen the half-opened blossoms of Spiræa Ulmaria. The tall, handsome spikes of Digitalis purpurea, formed bright spots in the landscape, relieved occasionally by the golden flowers of Tragopogon pratensis. Less observable were the plants of Symphytum officinale near the stream, and in other situations Bunium flexuosum and Epilobium montanum, the steep banks being carpeted with the delicate Oxalis acetosella and Fragaria Vesca, the latter in flower and fruit, interspersed with Lysimachia nemorum. Further up the valley were found Vicia sativa and V. sepium, and near the railway Onobrychis sativa, Knautia arvensis and Silene inflata, also a plant of Solanum dulcamara. A heavy thunderstorm coming on in the afternoon, put a stop to the investigations at an early hour.

GEOLOGICAL SECTION.

Friday, June 29.—The members of this Section made their second walk of the Season, and examined the lower lias quarries of Bedminster Down, chiefly for the purpose of correlating their beds and fossils, the position of the Cotham Marble or landscape stone being taken in each case as a starting point.

The Quarries on the Wells road were the first visited, and then successively those in the direction of Bristol as far as the junction of the Lias with the new red marls, which is well seen by the road side.

Among the fossils collected were two species of Cypridæ, probably of the genus Candona, which were found in such numbers as to completely cover the surface of a bed of White lias. With these were associated specimens of Estheria minuta, another genus of bivalve Entomostraca, and which in one of the quarries near the reservoir was found in good preservation, with the valves united, and showing the characteristic markings.

In the bank at the edge of the road leading to Bedminster Down, Mr. Stoddart pointed out a very remarkable argillaceous limestone, containing abundance of a fresh water plant (Naiadites petiolata) in such a good state of preservation that the monocotyledonous venation of the leaves was easily discernable with a lens. In the same bed was also noticed the Estheria before mentioned, and a few elytra of beetles.

A short distance above this, Mr. Pass discovered some very perfect teeth of the Saurichthys Apicalis, a fish characteristic of the lowest Lias beds. With them were scales of Dapedius and Pholidophorus. Their appearance here was worthy of note, because their position was rather higher in the Liassic series, than in the corresponding beds of Aust and Garden Cliff. The similarity of the Bedminster beds to those at Garden Cliff, is still greater from the occurrence of the well known Monotis decussata, and Myacites musculoides.

In a Quarry near the Limekiln, the dark coloured schists were seen to be covered with spines and broken tests of an Echinus (a species of Hemipedina). The members also brought away several examples of Lima, especially L. punctata, Astarte, some casts of a gasteropod resembling Phasianella and many others.

The Section thus spent two or three hours in a highly instructive study of the Bedminster strata, which was rendered most interesting and useful by the explanation of the President, Mr. Wm. Sanders.

BOTANICAL SECTION.

Botanical Walk, Tuesday, Sept. 4th.—No report received up to the time of going to press.

CHEMICAL AND PHOTOGRAPHIC SECTION.

Wednesday, September 12th.—Mr. P. J. Worsley, F.C.S., President, in the chair.

Mr. J. Beattie gave a verbal description of Pouncey's Carbon-Printing process. He stated that Pouncey had worked very laboriously to find a process of printing permanent sun-pictures, with all the qualities of prints taken by silver salts. His first plan was with chromate of potash and gelatine, which by exposure to light was hardened and rendered insoluble in water. The results of this process were very crude. He next tried Swan's process, with gelatine and Bichromate of Ammonia; and finally he devised a plan of printing in lithographic ink. He proceeded as follows:—Take a sheet of bag paper, make transparent with nut oil, and coat with a thin film of gelatine. Then take any oily pigment, as lithographic ink, and grind up with bitumen and benzole, and brush over the paper with it. Dry in the dark. Expose it to the negative from the back. Then dissolve out with turpentine, of which several baths are used. The picture is then dried and coated with a transparent varnish, which is allowed to dry till it becomes 'tacky.' It is then laid on card, or paper, or other material (to which it is desired to transfer it) and pressed. The thin paper is then stripped off, and the perfect picture left. Mr. Beattie exhibited some fine specimens on paper, wood, and canvas, and they quite bore out the high eulogium he pronounced on the process. If suitable colouring materials are used, the pictures can be transferred to porcelain, and burnt into the glaze.

Mr. Worsley exhibited some specimens of Swan's process, which had been furnished by that gentleman.

Mr. Beattie considered that the fine surface obtained by Mr. Swan rendered his process most suitable for portraits, while Pouncey's was by far the best for landscapes.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

OCTOBER, 1866.

GENERAL MEETING.

THURSDAY, OCTOBER 4TH—First general Meeting of the session. Mr. W. SANDERS, F.R.S., F.G.S., President, in the chair.

The Hon. Secretary read the minutes of the two excursion meetings, and stated that, had the weather permitted, it had been intended to arrange a third excursion, during September. He also laid on the table the following publications obtained in exchange for this Society's Proceedings:—

Memoirs of the Literary and Philosophical Society of Manchester, Third series, vol. I., 1862; vol. II., 1865.

Proceedings of ditto ditto, vol. III., Sessions 1862-63, 1863-64; vol IV., Session 1864-65.

The Hon. Treasurer called attention to the fact that the present rate of subscription did not cover the increased cost of printing the Proceedings, and moved "That an additional 2s. 6d. be subscribed for the present year, the financial year to commence in future with the sessional year, in May, instead of December."

The Editor of the Proceedings gave some particulars as to their cost, &c., and stated that the Council had failed in their efforts to procure advertisements, by which they had hoped to cover the increased expenditure.

Mr. Jacques seconded Mr. Stoddart's motion, which was carried unanimously.

The Hon. Secretary gave notice that at the next meeting he should move that Rule IX. be altered to read as follows :—

"That all Ordinary Members subscribe seven shillings and sixpence per annum towards defraying the expenses of the Society, the subscription to commence at their entrance, and to be renewed at the Annual Meeting in May."

The President then rose, and after expressing the pleasure he felt at again meeting the Society, read the following address.

"The object of the members of this Society is to become acquainted, to the greatest extent of which they are capable, with all the phenomena presented by the varieties of inorganic matter, and by the various forms of organized beings. Our society is properly named a Naturalists' Society. We study Nature in all its aspects. Our work is practical not speculative. We seek to promote the progress of *Positive Science* in preference to studying the vague questions of pure Philosophy, or the abstractions of Metaphysical Philosophy. Our methods are mainly Inductive. The speculations of the ancients were Deductive. With the Greeks theories were devised, and deductions attempted, but without results. It is said that the ancient Astronomer Democritus asserted that the Milky Way was a cluster of stars, but it remained for Galileo to demonstrate this fact. So Pythagoras and Plato are said to have enunciated a proposition respecting the attraction of bodies, resembling the grand discovery of Newton. But their idea must be pronounced only a fortunate conjecture, and on this account no deductions were made in explanation of the constitution of the universe. Newton, by studying and ascertaining the laws of the phenomena of attraction, discovered their relation with the squares of the distances. His generalization was gained by the Inductive process, the Baconian method. In this instance, the difference is manifest between the Speculative Philosophy of the ancient schools and the Positive Science of the moderns. The first was barren of results, while the latter, elaborated by inductive methods, has yielded truths of immense importance to the action of deductive processes. Our society will then avoid speculating on the essences, origin, and causes of things, and adhere to the study of the *phenomena* which they present. We must admit that the dreams of Philosophy have led on to the realities of science. Astrologers and alchymists were collecting facts for the future astronomer and chemist. The philosopher, who observed the fact of hydraulics, that on raising the piston-rod of a pump barrel, the water likewise ascended, was satisfied with the idea that "Nature abhors a vacuum." From this axiom no use-

ful conclusions could be deduced. Yet the diligent and persevering study of analogous facts tended towards the discovery of the true cause. And although the labours of the ancient philosophers were not wholly unproductive, yet the purely inductive path of Positive Science should be our course. Hence we should avoid the pursuits of the Metaphysician. We should touch very lightly on speculations about Vital Principle—Origin of Life—Nature of Force—and such like mysteries, and I think that attempts to discover the origin of species will not be popular among the students of pure science. Still less shall we be inclined to deviate from our own domain into that which belongs to the Theologian and the teacher of Religion. We will labour in the pursuit of *science*; and not doubting that truths of every kind are consistent, although we may not be able in some instances to reconcile them, we will carry on that pursuit wherever our search may lead us, free from the unreasonable fear, that a correct train of reasoning will ever terminate in fatal error. Natural science is based on pure reason. Religious knowledge, while consistent with reason, has its foundation on a Religious Instinct. The truths of each may appear incompatible and we may be unable to reconcile them. I believe that, in this life, we never shall comprehend this mystery; and I agree with the justness of the remark 'To *know* more, we must *be* more.'"

Fort-Major Austin, F.G.S., then read the following paper on "Rock-Basins, Logan Rocks, and Tolmên," illustrated with some drawings of the localities referred to.

Some years since, in a ramble through Cornwall, I had an opportunity of examining the different geological features of that interesting county, and accordingly rock-basins, logan rocks (rocking stones), and tolmên, attracted my attention. The so-called rock-basins are merely irregular depressions in the granite blocks, caused beyond doubt by the unequal weathering of the stone. While passing many days amidst the rocky masses which abound in Cornwall, I had ample confirmation of the opinion I had formed as to the origin of rock-basins, which certain fanciful antiquarians had ascribed to the Druids, who, it was averred, had scooped out these cavities in the granite blocks for some purposes connected with their religious rites. It was supposed that the rains and dews of heaven deposited therein that pure and untainted element which was required for the due performance of their superstitious ceremonies. Unfortunately for this learned hypothesis, it can be shewn that these said Druidical fonts are nothing more than natural cavities formed by the gradual decomposition of the felspar in the granite. It will be found that in the granite, crystals of felspar frequently occur in groups and patches, as well as disseminated generally through the mass. The felspar being more readily acted on by the atmosphere than the quartz and mica, which are also component parts of the rock, it follows as a necessary consequence that where these clusters of crystals of felspar occur, disintegration goes on with greater rapidity than where the more enduring materials prevail. Hence it is that in those

parts where these felspathic groups occur in the centre of a rocky mass, a cavity or rude basin is formed by their crumbling away. In fact, in some instances I have removed handsful of the loose felspar from rock-basins in course of formation. When the felspar superabounds at the side of a rocky mass, its decomposition merely forms an inequality or indent more or less deep, which never attracts attention. When the felspar is more abundant on the under surface of a projecting mass which is exposed to the weather, a rock-basin is formed by the same process, but no water can lodge in the cavity, and unless the Druids possessed the miraculous power of making basins and pitchers hold water with their mouths downwards, such inverted basins would have been of no use to them in collecting the dew and rain for the ablutions and purifications prescribed by their religion. It has also been conjectured that rock-basins were not only made for preserving lustral water, but for containing the blood of victims used as sacrifices. These are pure speculations, unsupported by a single fact. That the Druids used them for purposes of superstition is highly probable, but even this is mere conjecture.

Then as for the two kinds of rock-basins, one with channels of communication between the several cavities on the same stone, and the other with a single cavity only, the explanation already offered equally applies to them all, and there can be little doubt that the *Arch-Druid Time,* aided by the atmosphere, is the grand excavator of all rock-basins past, present, and to come. The fact that these cavities are frequently found near rocking stones in no way strengthens the supposition that the Druids formed them to contain their libations, because the same natural cause which produced one, gave rise to the other.

The sketch of the celebrated rock-basin at Carnbre, Cornwall, and known as the Carnbre Quoit, as well as the smaller one I saw at Treryn, will convey no idea of either being a work of art. Even men with stone implements could have made better shaped basins than these rudely formed depressions. The Carnbre Quoit has been figured in some antiquarian publications.

Besides the Cornish rock-basins, others occur amongst the Bradley rocks in Derbyshire, at Dartmoor, Devonshire, and some other localities. These rude basins may occur in other rocks than granite, but they were probably produced in a similar manner—by the unequal weathering of the stone, or by the surging waters on the sea shore, or the eddying currents of a river.

The author then minutely described a visit to the Rocking stone of St. Levan, 70 tons in weight, which could be set in motion by one man, and which had once been displaced and set up again by Lieut. Goldsmith many years previously.

Rocking stones in Cornwall are called logan rocks, from "log," a provincial term, "to rock, or vibrate." Logan rocks, like rock-basins, are produced by natural causes incessantly in operation—by the gradual decomposition of the two surfaces of compound masses in juxtaposition with each other, which are composed of ingredients of unequal durability, and which are separated by natural joints

into blocks of various dimensions. When the harder part of a mass, that is the quartz, happens to be in the centre, the surrounding surface crumbles away, leaving the incumbent block poised on a point or base sufficiently small to allow of its vibrating on a slight force being applied. When the quartz or harder material predominates at the sides, although the same amount of waste or crumbling of the softer parts may take place, and the decomposed portions be washed away by the rains, yet no rocking stone results therefrom, because the base on which it rests is too broad to allow of any lateral movement.

It can easily be imagined that in a district such as the Land's End, and western Cornwall generally, where the upraised granite has been exposed to the influence of the weather for many centuries, both logan rocks and rock-basins are frequently to be met with.

Rocking stones, like rock-basins, have been considered as the work of the Druids, but this opinion is evidently without foundation. The Druids may have used them to inspire their superstitious followers with an idea of their power and sanctity, in order to make the ignorant multitude believe them to be endowed with the attributes of a God. Whether the Druids used rocking stones for divination, or whether they were idols to be worshipped, or were made the fraudulent means by which the ignorant vulgar could be imposed upon, or whether the Druids ever used them at all, are mere matters of conjecture, for no records exist which can illustrate the subject with any degree of certainty.

Rocking stones occur in other parts of England as well as in Cornwall. Among the Brimham rocks in Yorkshire are several, the most remarkable of which rests upon a rude kind of pedestal. On a mountain between Knaresborough and Skipton, in the same county, another is recorded; as also are others near Warton Crag, in Lancashire, the Bradley Rocks, on Stanton Moor: Derbyshire is another locality which claims to possess one of these remarkable objects; at Drewsteignton, Devonshire, a remarkable one is said to be worthy of examination.

Among the natural productions of Cornwall, the tolmên demand notice; they, like the rocking stones, and rock-basins, though perhaps at an early period objects of veneration, or impious fraud, have been produced by natural causes, not by art. One of the most remarkable tolmên known is that of Constantine. This huge detached rock is seen from the eastern part of Mount's Bay, perched as it were on a distant hill top, midway between Helston and Falmouth. The estimated weight of this mass of granite is 700 tons, and unless the rock and the base on which it stands be purchased, it bids fair to become part of our national buildings at Chatham or Plymouth, as the granite quarries had, when I made a drawing of it, reached within a few feet of the natural pedestal on which it stands. An appeal had been made to the three Royal Societies of Cornwall, namely, Falmouth, Penzance, and Truro, in behalf of this rude memorial of nature, but with what success I cannot say.

Strictly speaking, the tolmên of Constantine is not a "holed stone," for the hole or open space is between its two points of support. The aperture thus

formed is visible at the distance of several miles. The name tolmên is derived from *tol*, "hole," and *men*, "stone"—holed stone. It has been considered that the ancients attributed great and miraculous virtues to such stones when ritually consecrated, and imagined that whatever touched, lay down upon, passed through or under such stones, acquired thereby a kind of holiness, and became more acceptable to the gods. All this appears to be conjecture, but it bears some countenance from the fact that in Bombay the Gentoos call these tolmên "rocks of purification," a passage through which is considered as purifying the penitent from all sin. *Pak Patan*, the name of an Indian town, also signifies "the passage of purity."

Mr. Grose considered the tolmên to have been intended and used for introducing proselytes or novices, persons under vows, or about to sacrifice, into the deepest mysteries of the Druidical religion.

As to the origin of tolmên, or holed stones, they are in all probability produced through natural agency, and I can see no good reason for supposing them to be the work of men's hands. Without going into the question of the original formation of granite, whether it be wholly an igneous rock, or whether water, as well as fire, performed an important part in its production, it may, I think, be admitted in either case, that when the materials of which it is composed were in a state of paste, entangled gases would cause cavities to be formed in the mass, and that when this mass was upraised and exposed to the action of the atmosphere, by the wearing away of the external coating, the apertures would become revealed to us and attract our notice, just as other phenomena of nature arrest our attention and invite our examination.

It is quite possible that tolmên may not be wholly confined to granitic districts, as cavities and inequalities are common to all stony masses, and therefore these holed stones may probably be met with far away from a granite country.

The President confirmed the views put forward by Major Austin in this paper, observing that many years ago he had himself personally investigated these remarkable rocks. He spoke of 'jointing' as a feature of many igneous rocks, and thought that the Torrs of Devonshire were the result of atmospheric action, remarking also upon the Druidical names, Stanton Drew, Drewsteignton, &c., meaning 'Stonetown of the Druids.'

Mr. Grundy called attention to the Buckstone stone in Monmouthshire, a large mass of conglomerate, 3 feet square at the base, which could easily be made to vibrate.

Mr. Pease, F.G.S., one of the Vice-Presidents, remarked how much opposed Major Austin's views were to those of the Danish archæologists, who attributed all these rocks to the Scandinavian mythology. He also advised that an excursion to the Brimham rocks near Harrogate should include a visit to the Plumpton Rocks.

Mr. Edmund T. Higgins, who had kindly come from London on purpose, then delivered an address upon Otoliths.

Remarking that his subject was essentially dry, except to a comparative anatomist, he referred to his thirteen years work upon the subject, and stated that his chief object that evening was to explain certain modifications in his views upon it, which had been brought about by a recent visit to the West Indies, because he considered himself indirectly responsible for views which had been previously advanced in that room. He was now enabled to state that these ear-stones had not only a distinctive *specific* character, but, contrary to former opinions, special *generic* characters also, and further, he believed that their microscopic structure would be found to be characteristic of groups. This was very important geologically, enabling species to be identified, and while many of the otoliths found in comparatively recent strata were identical with those of recent fish, a large anumber of those that occurred much lower down in the series, were identical with those of fish now existing in the tropical seas.

Mr. Higgins then sketched the auditory apparatus of Reptiles, Birds, and Mammals, and minutely described that of Fish. In this class, from the difference of the medium inhabited, a very different arrangement was necessary. Except in the first family of Percidæ, and in some of the Sharks and Rays, there was no vestige of any external ear or opening, the organs of hearing being hermetically sealed in the interior of the skull. They consisted essentially of three semi-circular canals, posterior, anterior, and external, and one vestibular sac, (seldom two, as frequently represented) communicating with each other in many and various modes. At several of the points of junction, enlargements (ampullæ) existed, containing the two smaller otoliths, while the large characteristic one was always found in the vestibular sac. The smaller otoliths had the power of motion through the canals, and were only absent in the lowest order ; and while the canals themselves in the bony fishes were covered with cartilage, those of the cartilaginous fishes passed through the very substance of the skull itself. Professor Muller had pointed out that three substances were concerned in transmitting sound to the auditory nerve of the fish, viz., water—the solid parts of the body—and the fluid of the labyrinth ; but the speaker considered that a fourth, the air-bladder, ought to be added. In the families of Cyprinidæ and Siluridæ especially, the otoliths formed a chain below the vestibular sac, where was a connection with a chain of bones behind the skull, and thence again with the air-bladder. The last named bones were probably the true representatives of the ear-bones of Mammals, as it was satisfactorily proved that these otoliths were neither the analogues nor the homologues of the 'Ossicula auditus' in Mammals, as they did not occupy the same position in the skull, the true ear-bones never being found, as these always were, in the vestibular sac or its connected canals. The speaker regarded these otoliths as an excessive developement of the 'otocone' of mammalian ears.

Mr. Higgins then described the otoliths more minutely. They were composed of carbonate of lime and phosphate of lime with a little animal matter, and it was

almost invariable to find three on each side. Out of 3700 fish examined, only about 9 had their organs of hearing deficient. In the case of 3, they only existed on one side, in a fourth they were cartilaginous instead of bony, &c. The otoliths of fish with cartilaginous skeletons were not solid, but aggregations of minute rhombic crystals of carbonate of lime. And in the sturgeon, which occupied a place between the bony and cartilaginous fishes, the otoliths were of an intermediate character also. The largest of the three otoliths was the only one valuable in a scientific point of view, and this varied in shape in every possible way. The groove on the under surface was no longer, the speaker considered, of any value as a specific character.

Mr. Higgins concluded his address by referring to the extensive collection which he had brought down, containing a portion of the result of 17 years work at the subject, including the otoliths of nearly 600 species, and by recommending these little bodies to the attention of the comparative anatomist, as being the only portion of the skeleton which possessed a specific distinctive character.

The PRESIDENT, in inviting discussion, remarked that the results of Mr. Higgins were a striking instance of the method of inductive science to which he had alluded in the earlier part of the evening.

Mr. W. W. STODDART said that no one would thank Mr. Higgins for his address, and for the exhibition of his specimens, with greater sincerity than he did himself. He considered Mr. Grove's recent text of 'continuity' (at his Nottingham address) as the cause of the difference of opinion between them, and of the views formerly expressed, but now modified. While allowing that fish did not hear as air-breathing animals did, he still considered that the office of these otoliths, was, from their density, to increase the vibration caused by the sound.

Mr. HIGGINS controverted this, and pointed out that all animals which really and truly heard, gained experience by hearing, but that this was not the case with fish, and he regarded this as the strongest proof that fish did not *hear*, but believed that they *felt* through their whole body the vibrations caused by the sound.

Dr. HENRY FRIPP considered Mr. Higgins' generalisations very valuable—especially with regard to genera. It was of the greatest importance, physiologically, to obtain characteristics of any genus, species, or class, connected with a sense so highly important as that of hearing; these otoliths might be of the greatest importance, even more so than the 'ossicula auditus' in this respect. Considering that the office of the semicircular canals was to indicate the direction of sounds, he thought that the otoliths might materially assist this function. On the greater or less perfection of the sense, both for obtaining prey, and for indicating the approach of danger, the life of the fish depended. The noises made by the fish in water were received by them as vibrations, and in a paper read

at a previous meeting he had explained how the thickness of the skin deadened the sense of touch. The question of the character of the ear was connected with the intensity of the faculty of hearing, and Dr. Fripp laid great stress on the fact that the otolith was evidently not an accidental production, being always found in one place. The ossicula auditus of air breathing animals only served for the transmission of sounds from one membrane to another.

Mr. S. H. Swayne referred to meetings of the Zoological Section, where this subject had been discussed, and spoke of the molecular constitution of otoliths, as somewhat resembling that of certain little bodies in the scales of fish.

The President expressed pleasure at Dr. Fripp's considering that this generic or specific character was associated with a sense of high physiological importance, and remarked that the molecular differences existing among otoliths might be paralleled in the mineral kingdom.

Mr. A. Smith enquired if Mr. Higgins had investigated the sense of smell in fish.

Mr. Higgins having replied in the negative,

Dr. H. Fripp said that in many fish it was so developed that they hunted by its aid. The sensory apparatus consisted essentially of olfactory sacs, through which currents of water were constantly passing.

The Hon. Secretary announced that at the next general monthly meeting, Professor James Buckman, of the Royal Agricultural College, Cirencester, would deliver a discourse upon the structure and economy of British Grasses.

MEETINGS OF SECTIONS.

ENTOMOLOGICAL SECTION.

Tuesday, October 9th.—Mr. F. V. Jacques in the chair.

Mr. Groom-Napier exhibited and made some remarks upon a fine species of Cicada, captured in Greece. The species exhibited, Cicada

Pleleia, was four inches in expanse of wings, which were beautifully veined with brown, the abdomen of a rich horn color with bars of yellow, the thorax resembled tortoise shell finely sculptured, and the head was green. Mr. Napier supposed this insect to be the Cicada menioned by Virgil and Ovid, as the noise caused by the insect was very much greater than that of any grasshopper. He observed that the species was often very destructive to fruit trees in Southern Europe, as it obtained its food like the rest of the order to which it belonged, the Homoptera, by sucking the juices of plants.

Mr. Barber exhibited a box containing several hundred specimens of Homoptera, captured in the Bristol district by himself. The collection, which included a large number of species, was much admired by the members.

The Secretary exhibited three species of Lepidoptera, taken by himself during the summer, and not hitherto recorded as occurring in the district, viz. :—

Acidalia inornata.
Phycis abietella.
P. Carbonariella.

Also a series of Eupithecia pulchellata, bred from the seed pods of Digitalis purpurea.

Mr. Clarke exhibited a nice series of Lycœna Adonis, captured during the summer on Durdham Down. This beautiful species had appeared in some abundance this summer, and had not been recorded as having occurred in the district before.

Mr. A. E. Hudd exhibited a box containing, among other species—
Lycœna adonis.
Acronycta leporina.
Lobophora polycommata.
Eupithecia campanulata (new species).
Eupithecia constrictata.
Ephestia pinguedinella.
Phycis carbonariella.

CHEMICAL AND PHOTOGRAPHIC SECTION.

Wednesday, Oct, 10th.—Mr. P. J. Worsley, F.C.S., president of the section, in the chair.

The attendance of members was large. The Secretary announced the resignation of Mr. W. H. James.

The Secretary exhibited, through the kindness of Mr. George Finzel, a beautiful series of large photographs of Athens and the neighbourhood, taken by a native photographer, many of which were remarkable for their exceeding softness, as well as delicacy of finish.

Mr. W. W. Stoddart then made a verbal communication upon a new application of the magneto-electric machine. He wished to show to the members a new experiment which he had seen at the Nottingham meeting of the British Association. The novelty consisted in using the current from a magneto-electric machine, instead of, as usual, from a voltaic battery, as the primary or exciting current in a large induction coil, the secondary current of which was made to pass through Geissler's vacuum tubes in the ordinary manner, showing the length of, and stratification in, the discharge. Mr. Stoddart minutely described the structure of the magneto-electric machine, showing how it owed its action to the property of induction, and pointed out that the quantity of electricity produced by its aid was much less than even by a small voltaic battery, and hence the spark obtained from the induction coil was in this case very small. He also drew attention to the fact that, in this arrangement of apparatus, no contact breaker was needed on the induction coil, as the current from the source of electricity was intermittent.

A discussion then took place between Mr. Beattie, Mr. Stoddart, the President, Mr. Noble, and Mr. Carpenter on the laws and nature of force, the use and abuse and improper meanings attached to scientific terms, &c.

ZOOLOGICAL SECTION.

Thursday, Oct. 11th.—Mr. W. Sanders, F.R.S., President of the Society, in the chair.

The attendance of members was limited. The paper on Baleen, by Mr. S. H. Swayne, announced for that evening, was postponed.

Mr. C. O. Groome-Napier, F.G.S., read an elaborate paper on "Animal and plant prototypes," in which he endeavoured to trace the resemblances and differences between man and the lower animals, or even plants. The illustrations of man took two forms, analogy, and actual resemblance.

Among plants there were many types of man. Red fruits were generally acid, corresponding to red-haired races of men, which were usually fiery. Black fruits were strong in taste, and black-haired races, similarly, were little susceptible of improvement. Light-coloured fruits were generally delicate in flavour, aad corresponded to light-haired races. This was carried out in the eggs of birds, and in some other plants, though occasionally colour might only be an accompaniment, and not necessarily a cause. Passing to the animal kingdom, Mollusca, soft pulpy animals, corresponded to men with flabby constitutions, and so with many tribes similar resemblances were traced—for example, between certain tribes of cows and Englishmen, whence the term John Bull was probably derived, that element being easily recognisable—stress being frequently laid upon physiognomical characteristics. The pig and some other animals had been condemned by the Semitic race. Mr. Napier concluded his paper with some interesting observations upon the influence of daily life and surrounding objects upon men and animals, and the power of man in modifying the characteristics of animals according to his own wishes.

In the discussion which followed, Mr. Geo. Harding, Jun., mentioned several white flowers of very powerful scent, and green fruit of decided taste, which were not in accordance with the author's theories; and the President commented upon the fanciful ingenuity displayed by Mr. Napier.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

NOVEMBER, 1866.

GENERAL MEETING.

THURSDAY, NOVEMBER 1ST.—Mr. W. SANDERS, F.R.S., F.G.S., President, in the chair.

The HON. SECRETARY announced that Mr. Philip John Butler, of London, and Mr. Chas. Phipps Lucas, of Redland, had been elected by the Council as ordinary members; also that the following donations to the Society's library had been received:—"The Popular Science Review for 1866," from Dr. Henry Fripp, and "The Geologist," Nos. 1 to 21, from Mr. W. J. Fedden.

The following resolution, which had been passed at the November meeting (*vide* pp. 63, 64), was then confirmed:—

Moved by Mr. STODDART, seconded by Mr. JACQUES, and resolved:—

> "That an additional 2s. 6d. be subscribed for the present year, the financial year to commence in future with the sessional year."

The alteration of Rule IX., proposed at the last meeting by Mr. Leipner, and duly seconded and supported, was also unanimously confirmed. The rule will now therefore read as follows:—

Rule IX.: "That all Ordinary Members subscribe *seven shillings and sixpence* per annum towards defraying the expenses of the Society; the subscription to commence at their entrance, and to be renewed on the *Annual Meeting in May*."

Mr. LEIPNER then rose, and, after thanking the members for agreeing to his proposition, said that he hoped that as little trouble as possible would be given to the hon. treasurer, when he had to collect the additional subscription.

Mr. RICH, a gentleman formerly resident in Bristol, but now in London,

called the attention of the meeting to a remarkable variety of Helix rufescens, with a depressed spiral, brought to his notice as occurring here by Miss Jellie, of Redland. It had not been publicly shown before, and the name Helix rufescens, var. compressa, was proposed for it. He also stated that Clausilia bilicata, and C. Rolphii, generally supposed to be oviviparous, had been observed by him to be viviparous.

The PRESIDENT then invited Professor Buckman, late of the Royal Agricultural College, Cirencester, one of the Corresponding Members of the Society, who had come purposely from Dorsetshire to be present at this meeting, to address the Society upon "The Structure and Economy of British Grasses."

Professor BUCKMAN, in introducing his subject, said that he had chosen it because it was one to which so little attention was generally paid. No country—not even excepting Ireland—was so remarkable for the number and variety of its grasses as England; nowhere were such meadows and lawns to be found. Grasses were very wonderfully made, and were composed of but few and very simple elements, though these were almost infinitely varied. Even among professed botanists there was great ignorance existing as regarded the names of the grasses, the same species being sometimes differently named by two or three botanists. The speaker had seen instances of this, and, from his connection with agriculture, had been led to pay great attention to this beautiful tribe of plants. He proposed to describe their structure in general terms, and to add a few words on their general economy, as derived from a somewhat extended experience.

Professor Buckman illustrated his remarks by drawing several diagrammatic sketches on the blackboard, and by a collection of drawings and dried specimens of almost every known species of British grass.

The structure of the *stem*, or culm, was first described. It was shown to be constructed so as to obtain the greatest amount of strength out of the smallest amount of material, being a hollow tube—or fistular—additional strength being given by solid nodes, which were nearer together at the base than at the upper part. The only grass in which there was no node, or at least only one at the bottom of the stem, Molinia Cœrulea, had a solid stem. The manner in which the leaves folded over the stem was then explained, and the existence of a small organ between the stem and the sheath of the leaves, called the *ligule*, was pointed out. This ligule was composed of a very thin membrane, closely adherent to the stem, and its purpose apparently was to keep the leaves in their position. The variations in the structure, character, and position of this ligule were deserving of attentive study, because upon them many of the most reliable modes of distinguishing species were founded. The *flowers* of the grasses were then spoken-of, and they were shown to be in their general plan merely altered arrangements of the leaf developments, although the details were varied to an immense extent. The flowers differed greatly in appearance according to whether the florets were sessile (*i. e.* without stalks)

or on pedicels—whether the pedicels were long or short, weak or stiff, horizontal or inclined, cleft in two or single, close together on the stem, or at longer or shorter intervals, numerous or few; in fact, it was noticed that a very slight alteration in the arrangement of parts materially affected the general appearance of the whole flower. The structure of the seed-vessel and of its surrounding envelopes was then described, and it was shown that another set of distinctions between different species and varieties was given by the adhesion or non-adhesion of these envelopes. For example, the adhesion, or otherwise, of the corolla to the grain gave the distinction between wheat and barley. The speaker stated that there were about 150 species of British grasses, but that these were so varied that the grasses were usually very easy to discriminate; it was very fortunate that all the forms could be reduced to a simple principle, or type-form, from which a great variety were moulded; and on this account, if on no other, grasses were well worthy of study.

In entering upon the second portion of his subject, the Professor remarked that, out of all the 150 known species of grass, only ten or twelve formed the bulk of any good meadow, these being, so to speak, masters of the situation. In bad pastures, on the other hand, as many as 50 species might occasionally be found, and of these, five or six would be so prominent as to indicate that nothing was right there, and so also, *mutatis mutandis*, with good pastures. The speaker considered the gradual deterioration of a pasture to take place somewhat in the following way:—Even in the best pieces of land some corner or out-of-the-way spot would probably, from dampness, or some other cause, be not as good as the bulk; on this the bad species would be found, and if the farming was not good, from neglect of top-dressing, or other reasons, the bad grasses would gradually begin to spread. Grasses grew together very closely, and yet two species could not, of course, occupy the same place at once, and a struggle for existence was commenced; in poor ground the bad species obtained the mastery, and though a war of extermination was constantly going on, such a balance was maintained that the number and kind of species of grass growing on any given piece of land, would give, to those who understood them, such an intimate acquaintance with the nature and properties of the land as no other set of circumstances connected with grasses could possibly do. In reference to the best mode of turning bad pasture into good, Professor Buckman said that he had found it advantageous by practical experience, to fold sheep upon it. The poor grass was either eaten or trodden down by them, and thus a manure was formed, when, the soil being thus improved, the better grasses would grow. This tribe contained some of the most important plants in the country, even independently of the cereal grasses; a vast amount of man's food—butter, cheese, meat, &c. being indirectly dependent on the pastures.

The speaker then called the attention of the society to the changes produced in grasses by irrigation. He had watched some land, worth about

£1 an acre, which was irrigated, and had remarked the changes in the comparative number and bulk of various species caused by irrigation.

	Commencement.	After 2 years.	After 4 years.
Good ..	7	16	25
Middling ..	10	6	2
Bad ..	17	—	—

The above statement was not to be taken as absolutely correct, for it was a very difficult thing *entirely* to kill and extirpate a grass. With respect to the species indicative of different kinds of soil,

About	40	species were found in	..	bushes, jungles, &c.
,,	10	,, ,,	..	aquatic situations.
,,	14	,, ,,	..	by the sea side.
,,	35	,, ,,	..	meadow land.
,,	23	,, ,,	..	arable land & as weeds.

All these species, according to their number, and the comparative well or ill-doing of each, would point out the exact condition in which any given field, or other piece of land, might be. The same species would frequently vary so much in size, that specimens of the two extremes were considered as distinct species, e. g., among the Fescues, Festuca loliacea, and F. loliacea var. pratensis.

Professor Buckman concluded his discourse by commending the study of these beautiful plants to the members generally, and especially to the ladies, whom he begged to look at them occasionally, as more beautifully varied forms did not exist; they were well worth the botanist's attention also, as they really were not that difficult tribe of plants that they were usually considered to be—and he considered that any proprietors of land would be very fortunate if they profited by all the lessons which the grasses were capable of teaching them.

The President, in inviting discussion, remarked upon the philosophical manner in which Prof. Buckman had handled his subject.

Mr. James Phillips enquired why, when sheep were folded on a piece of land, the good species as well as the bad were not trodden down, and thus both killed?

Prof. Buckman admitted that, to some extent, they would be, but that by the treading-in, &c., of animals, the ground would be made so much richer that the bad grasses would scarcely grow, while the good ones would flourish.

Mr. A. Leipner thanked the speaker for his address, and for having given the Botanical Section a good subject to work upon, referring to the fact that on a former excursion to Avonmouth, Prof. Buckman had gathered 40 species of grass, showing this neighbourhood to be comparatively rich in them. As a practical Botanist, he wished to ask what other parts besides the ligule were least variable, and most useful for the determination of species?

Prof. BUCKMAN replied that there were a few other characters to be relied upon; *e. g.* in the outer envelope, whether the calyx and uvule were equal or unequal, and so also of the calyx and corolla. The presence or absence of an awn, and its variations in length, also furnished characteristics. Many of these matters were very difficult to explain orally, though they could very readily be learnt in the fields, and, to a practised eye, the general look of a grass was generally enough to determine the species, without going into a minute analysis of the various parts.

A VISITOR said that he represented a large body of working farmers, amongst whom two notions were prevalent—first, that the soil of old pasture contained the seeds, or germs, of *all* grasses, and secondly, that the bad ones might be improved into good, and made the stronger of the two.

Prof. BUCKMAN said that he did not believe in the actual conversion of one grass into another, *e. g.* that Italian rye-grass could ever be 'converted into' couch grass, Triticum referens, but he considered that if the two were left growing in the same place, as they could not co-exist, the couch-grass would become the master in the struggle.

The VISITOR wished still to know whether a poor grass might be so altered by cultivation as to deserve a special name, whether, in fact, if good grasses failed to come up, the bad might be converted into good.

Prof. BUCKMAN referred to the wide importance of the subject thus opened up. He held that—as it was so long before a good pasture could be laid down, it was desirable to use every means, such as judicious manuring, before breaking it up, a proceeding which should only be resorted to in extreme cases. Bad grasses were readily expelled, and good gained the ascendancy, very readily under favourable conditions.

Mr. LEIPNER enquired how many British grasses were serviceable for meadows, and how many were actually pernicious?

Prof. BUCKMAN said that though 12 were useful, the bulk of meadow grass consisted of only six or eight species—and that the meadow was better in proportion as other plants besides grasses were kept out. Very few grasses were absolutely poisonous.

Mr. RAVIS enquired why the grass on Durdham and Clifton Downs was so very fine and short?

Prof. BUCKMAN said the species was Festuca ovina; the leaves were very small, and could often be cut. Their size was probably owing to their upland situation, as different geographical positions exercised great influence on grasses generally. F. ovina was a form of which some botanists put down three or four species, but the speaker believed he had obtained them all from a single position.

Mr. GRUNDY enquired if there was any good mode of extirpating daisies from a lawn?

Prof. BUCKMAN had had practical experience in the matter, but, being fond of them, did not remove them from his own lawn. They were a

blemish, however, and their presence was a sign of the soil being poor, and the best mode of getting rid of them was to apply manure, whether soot, superphosphate, or in some other convenient form.

The PRESIDENT, in closing the discussion, moved a vote of thanks to Professor Buckman for his able and interesting discourse, and for the obliging manner in which he had answered the various queries put to him. The vote was carried by acclamation.

MEETINGS OF SECTIONS.

BOTANICAL SECTION.

THURSDAY, OCTOBER 18TH.—The first evening meeting of the Session, Mr. J. W. CLARKE occupying the chair. The minutes of the previous meetings having been read and confirmed,

Mr. H. CHARBONNIER exhibited an interesting series of Anthers and Pollen grains prepared for microscopic observation. The appearance and shape of the pollen varied considerably in different plants. In those from the Fuschia the grains were pyramidal, and the exhibitor had partially succeeded in inducing the protrusion of the pollen tubes by artificial means. Those from Althœa officinalis were spherical and covered with knobs, and in this particular resembled those from the Anthers of Onopordum acanthium. In Cichorium Intybus the grains were seen to be polyhedral, and in Calluna vulgaris to be generally arranged in fours. The smallest shown were from Tanacetum vulgare and Antirrhinum majus. In those from the garden Geranium were seen the parts from whence the pollen tubes would issue, the membrane being probably thinner at those points; and those from the garden Stock and Leontodon taraxacum were strongly marked on the surface. The difference in shape between grains taken from an endogenous plant, and those from exogenous plants, was shown by some from the flower of Lillium candidum, where they had only one longitudinal fold, whereas in Convolvulus major and Centaurea Scabiosa, they each had three folds.

Mr. GROOME-NAPIER exhibited a piece of Jappa or native cloth of the South Sea Islanders, manufactured from the woody fibre of some plant; also, a piece of Cassava or Manioc bread, made from the root of Jatropha

manihot, which in its raw state is highly poisonous, but by pounding and repeated washing is rendered edible; the piece shown was made in Tobago.

THURSDAY, NOVEMBER 15TH.—Mr. LEIPNER, President of the section, in the chair.

With regard to "Pollen," the subject which had been discussed at the last meeting, the President said that it had been remarked that plants having star-shaped flowers, generally had pollen marked on the the outer membrane with protuberances which gave to the grains a star-shaped appearance likewise. From recent experiments it had been demonstrated that the previous theory of the pollen tube, viz., that it was a simple extension of the inner membrane of the grain down which the fovilla passed to fertilize the germ, was erroneous, and that this extension of the pollen grain was the result of actual growth, being composed of cellular tissue, and that there was no other fertilizing agent besides the cell contents.

A new analysis of the gluten of wheat was noticed. Being formerly said to consist of fibrine aud vegetable albumen, it was now separated by a French chemist, into Albumen, Fibrin, Casein, Immulcine, and a new principle called Glutine.

Mr. YABBICOM showed a series of Sea-Weeds, taken at Llanduduo, North Wales, embracing among others :—

Gigartina mamillosa.	Delesseria hypoglossum.
Furcellaria fastigiata.	Rhodymenia ciliata.
Chondrus crispus.	Griffithsia setacea.
Plocamium coccineum.	Porphyra lactiniata.

Mr. B. N. LOBB, exhibited a collection of the same class of plants gathered at Lynmouth, North Devon. Among them were :—

Delesseria sanguineum.	Lawrencia pinnatifida.
Delesseria hypoglossum.	Bryopsis plumosa.
Dictyota dichotoma.	Porphyra vulgaris.

And several species of Ceramium, Polysiphonia, Ectocarpus, and Cladophora.

GEOLOGICAL SECTION.

THURSDAY, OCTOBER 25TH.—First evening meeting of the Session, Mr. W. Sanders, F.R.S., F.G.S., President of the Section, in the chair. There was a good attendance of members, and two new names were received of gentlemen wishing to join the section.

Mr. RAVIS exhibited a fine specimen of fossil wood, in which the rings of growth, knots, &c., were well preserved. He could not with certainty trace the place where it was found, but it was put into his hands as coming from Teneriffe, which was, he believed, an island of purely volcanic origin.

Mr. W. W. Stoddart, F.G.S., read a paper on Tribolites, so called from their being divided into three lobes. They were among the most ancient forms of animal life, and had no living representatives, the nearest approach being the Limulus or King-crab, common in the West Indies. The general structure of this Crustacean was described, and particular attention drawn to the hinder legs, which served the office of gills, each carrying on their outer edge a series of plates like the leaves of a book—whence the name Phyllopod, 'leaf-footed.' Except the dorsal part and the immoveable epistoma, the whole of the under surface of the body was soft and perishable, which would account in great measure for the assertion of some writers that Tribolites had no legs. The number of genera and species of Tribolites was very large, more than 200 species being found in Great Britain alone. The Agnostidæ were the lowest in organization, the Phacopidæ the highest. Tribolites were brought into being at the earliest part of the Cambrian period, attained their fullest development at the Llandeilo and Caradoc ages of the Silurian, and died out in the upper Carboniferous shales. Mr Stoddart then, by the aid of diagrams, minutely described the parts of the Tribolite usually found, giving the palæontological terms for them. The fossil remains were formed from a chitinous substance, probably identical with the valves of a Lingula, or the elytra of beetles, and were divided into the head or carapace, divided by many kinds of furrows; cheeks fixed and moveable; the front margin of the head with the rostral shield and labrum or epistoma; the thoracic rings and side lobes or pleurae (always anchylosed); on the number and variety in which specific distinctions were founded; and the pygidium or tail. The head afforded generally a very reliable means of determining genera. Some Trilobites, as the Calymenidæ and Asaphidæ, had the power of rolling themselves up into balls—and a section of a Calymene was exhibited, in which it was thought that traces of phyllopod feet could be detected. The Olenidæ and Ogygidæ had not this power. A specimen of a very rare Trilobite, Encrinurus valeolaris, was also shown, only one other specimen, and that in the British Museum, being known to the speaker as having been hitherto found. Mr. Stoddart then briefly described the exquisitely beautiful eye of the Tribolite. It was compound, like those of insects—being made up of a number of prisms, and having a crystalline lens and pupil, but all arranged under one cornea, and terminating in the optic nerve. Mr. Barrande stated that he had ascertained more than 30,000 facets in each eye of Brontes palifer. Some species, however, did not show any facets, which were most developed in the Phacopidæ. In the remains of earliest Tribolites, eyes were always absent, probably from the cheeks being moveable; but in some cases, as in the Anopolenus, the cheeks, eyes, and head spines, usually supposed to be absent, were found in an abnormal position.

The President, in commenting upon the paper, made some appropriate remarks upon these medals of creation, and upon their importance as being in many cases peculiar to, and characteristic of, certain definite strata.

ZOOLOGICAL SECTION.

THURSDAY, NOVEMBER 8TH.—Dr. HENRY FRIPP, President of the section, in the chair.

Mr. S. H. SWAYNE read a paper on "Baleen, or Whalebone." He said that this curious animal substance is derived from the Edentalous division of the Cetacea, which comprises the genera Balœna, Balœnoptera and Megaptera. The "right," or whalebone whales have no fin on the back, a very bulky body, and an enormous head, with very long straight baleen plates. The Balœnoptera, or "Fin-Whales," a slighter form and smaller head, a high fin on the back near the tail, a plaited belly and twisted baleen plates. The Megaptera, or "Humpbacks," a blunt-shaped head, a lump or excrescence instead of the back-fin, and baleen like that of Balœnoptera. At least three principal forms of Right-whale are known, represented by the Greenland, the Cape, and the North Atlantic. Of these there are probably several species. The two former furnish most of the baleen of commerce. The head is largest in the Greenland (*Balœna Mysticetus*) being one-third the total length and thick in proportion. This depends chiefly on the size and length of the jaws. The wide space between the narrow highly-arched upper jaw and the straighter lower jaw is occupied externally by the baleen plates, covered by the very large lower lip. The plates form two series of upwards of 300 on each side, and with two corresponding series of short subsidiary plates inside them, combine to make a large vaulted roof to the mouth. The shape of each lamina or plate is a long triangle, of which the base is broadest in the Fin-Whales and Humpbacks, and is attached edgewise to the sloping sides of the narrow upper jaw; the apex pointing downwards and outwards towards the widely-spread branches of the lower jaw, one smooth edge looking outwards and a little backwards, and the other fringed throughout with bristles several inches long, being turned inwards towards the large tongue. The whole roof of the mouth is thus covered with a bristly lining, which serves to entangle the small Pteropods, &c., upon which the whale subsists. When feeding, the whale takes in a mouthful of water, full of these floating Molluscs, and on closing the mouth the water escapes again laterally between the baleen-plates. For the most part the plates are pretty uniform in length, but they rather suddenly diminish at each end of the series, from perhaps 11 or more feet in the middle to three or four inches at the ends. The bases of the plates are embedded in a soft white spongy gum, which also forms a raised bead or edge along the outside of each series, and is called the "wreath-band." Dr. Gray has described several varieties of baleen, which he thinks may belong to as many species of Right-whale. Of these the Greenland is the best, being long, flat, and tapering. The baleen of Balœnoptera and Megaptera is short, from a few inches to about two and a half feet long, and broad in proportion, with coarser bristles, and is commonly curved or twisted. A thin section of baleen exhibits in

the centre the ends of a number of horny hair-like fibres in single series, or perhaps twelve or fourteen across the short diameter of the plate (according to the species), in shape circular, oblong, or polygonal. Outside these is a layer of horny matter, of nearly equal thickness, which also dips in between the bristles. This exterior cortical layer, like the bristles themselves, is fibrous in structure, and more or less colored by pigment. Each bristle consists of a number of concentric layers, enclosing a central medulla or pith made up of large cells. A section of baleen from Balœnoptera may be readily distinguished from one from Balœna by the *larger size and fewness of the hairs.* As to the growth of the plates—on examining the base of a plate we find a flat hollow two or three inches deep, in which was lodged the soft pulp-blade from which the plate was formed. From the edge of each pulp-blade a number of soft filaments proceed, which become converted into the bristles, the cortical part being formed from the sides of the pulp-blades. Eschnecht and Reinhardt (Ray Society, 1866) do not agree with Hunter and Owen (Odontography) that the cortex is formed from the soft gum, but rather from the sides of the pulp-blades. The pulp-blades of the Balœna are shorter than those of the Balœnoptera, although the plates formed from them are so much longer. According to Eschnecht and Reinhardt baleen is not formed until the latter half of fœtal life; and the pulp is ten times longer in proportion in the new-born than in the full-grown whale. At its first formation bristles only are seen to project from the gum. It is clear that the central laminae grow much faster than those at either end, for at birth none are more than three or four inches long, and in the adult the middle ones are 11 or more feet long, while the end ones have scarcely increased. This also applies to the subsidiary blades. Owen (Odontography) compared the cortex to the external cement of teeth, but even if this were correct there would still be nothing analogous to the enamel organ of teeth. The discovery of a number of small abortive denticles in the jaws of a fœtal Balœnoptera shows that baleen and teeth are not homologous, but vicarious. Mr. Swayne proceeded to show the similarity in structure of baleen and rhinoceros-horn and some other hair-structures, and viewed them all as "compound hair-structures." Microscopic preparations were exhibited, and baleen plates from three or four species of whale.

ENTOMOLOGICAL SECTION.

Tuesday, November 13th.—Mr. Stephen Barton, President of the Section, in the chair.

The President exhibited some specimens of a minute species of

Microgaster, a genus of the Ichneumonidæ, singular from their being parisitical in the eggs of some of the larger lepidopterous insects.

Mr. NOBLE sent for exhibition a fine specimen of a species of Phasmidæ captured in Assam.

Mr. A. E. HUDD exhibited Sesia Philantheformis, a new species recently captured in the Isle of Man; also a cocoon of the same in a dead flower-head of Armeria Maritima (Sea Pink). Dianthæcia Capsophila, also captured in the Isle of Man. Dasycampa Rubiginea taken at Ivy-bloom, at Leigh, in October, and Xanthia Gilvago, taken in Derbyshire.

Mr. HUTCHINS exhibited the following species captured at Ivy-bloom, at Leigh:--Dasycampa Rubiginea, Xylina Petrificata, X. Semibrunnea, and X. Rhizolitha; also, Hoporina Croceago, a fine species not hitherto recorded as occurring in the district.

The SECRETARY exhibited a box containing, among other species, Sesia Scolioeformis, captured at Llangollen; Sesia Philantheformis, from the Isle of Man; Sesia Chrysidiformis, from Folkestone; D. Sicula, captured at Leigh; D. Templi,at Clifton; L. Putrescens, from Torquay; Lithostege Nivearia, captured at Brandon, in Suffolk; C. Ocularis, bred.

The rest of the evening was occupied in examining a number of microscopic objects, principally scales of British and Foreign species of Lepidoptera and Coleoptera, prepared and exhibited by Mr. J. W. Clarke.

CHEMICAL AND PHOTOGRAPHIC SECTION.

WEDNESDAY, NOVEMBER 14TH.—Rev. W. WHITING in the chair.

Dr. W. BIRD HERAPATH, F.R.S., &c., read a paper upon Dr. Muspratt's new spring at Harrogate. After referring in general terms to the character of the Harrogate waters, the speaker quoted the results of analyses made several years ago by Dr. Hofmann, by whom the various springs were grouped in four classes.—1, the strongly sulphurous; 2, the milder sulphurous; 3, the saline chalybeate; and 4, the pure chalybeate. The total quantity of solid constituents varied from 11 to 1,096 grains per gallon—the chief constituent in excess being common salt, and the quantity of sulphide of sodium ranging from 0.3 to 15 grains per gallon. In 1865 Dr. Muspratt had analysed the water of one of the four saline chalybeates, which same spring had been examined in 1854 at the same time as the others, by Dr. Hofmann, and he found to his surprise, a very remarkable alteration in the character of the water; instead of 285 grains solid constituents there were 465, all the chlorides except that of potassium had increased, and also the carbonate of iron, while chlorides of lithium and barium were present in addition, and were entirely new constituents, as was

also protochloride of iron, which amounted to 16 grains per gallon, and was only known to occur in two other springs, both of which were on the Continent. Dr. Muspratt's remarkable results had been confirmed by Dr. Herapath himself, as well as by Prof. Miller, of King's College, London. The speaker illustrated his remarks with a number of preparations, showing the amounts of various substances obtained from given measures of the water, and also by a number of delicate tests which demonstrated the nature of the constituents, in the course of which operations he pointed out that the presence of protochloride of iron in any water materially interfered with the action of the permanganate of potash test for organic matter, the iron salt being rapidly oxidised just as organic matter would be. It had been proposed to give the name of Muspratt to the spring, in honour of the chemist who first made known this remarkable change in its character.

Mr. W. L. Carpenter exhibited several beautiful specimens of carbolic acid, manufactured by F. C. Calvert, and Co., Manchester, and made a few remarks upon its manufacture and uses, pointing out its chemical relations to other known substances.

He also showed a number of pieces of gun cotton, in various shapes, and for different uses, manufactured by T. Prentice & Co., Stowmarket, Suffolk. The speaker gave a short account of its mode of manufacture, and of the recent explosion at Woolwich.

Rev. W. Whiting, *àpropos* of gun cotton, described his process for preparing structureless collodion, in which the base of the pyroxiline was Swedish filtering paper.

PROCEEDINGS

OF THE

Bristol Naturalists' Society.

DECEMBER, 1866.

GENERAL MEETING.

Thursday, December 6th, 1866.—Mr. W. Sanders, F.R.S., F.G.S., President, in the Chair.

The minutes of the previous meeting having been read and confirmed, the Hon. Secretary called the attention of the Society to a re-issue by the Christian Knowledge Society, of Miss Pratt's work on "Poisonous, Noxious, and Suspected Plants," which contained 40 accurate and beautifully coloured drawings, and was to be obtained at a very small cost.

Mr. H. K. Jordan, F.G.S., rose to make a few remarks upon the exhibition at the previous meeting of a new variety of Helix rufescens, for which variety Mr. Rich, who showed the shell, had proposed the name "compressa." Mr. Jordan said that he had exhibited a series of the same shell, obtained from Paignton, Devon, at the February meeting of the Zoological Section (*vide* Proceedings, page 12), and that the name "depressa," which he considered more suitable, had then been adopted for it, in which Miss Jellie had since acquiesced. He therefore thought that this variety should be known as Helix rufescens, var. depressa, in which opinion the meeting concurred.

A paper by Mr. C. O. Groom-Napier, F.G.S., on "The Economic Value of British Insects," was then read by the Hon. Secretary, Mr. A. Leipner, the author being unavoidably absent in London.

After alluding to the popular belief that insects were vermin, made to be taken and destroyed on every hand, the author spoke of their immense number, both as individuals and as species, and said that he should confine his remarks to the British members of the class Lepidoptera, butterflies and moths. British butterflies numbered about 68 species, of which at least 20 were too scarce to be of any economic importance. In nearly all cases, however, it was necessary to consider the habits and food of the larva rather than of the perfect insect. Some caterpillars fed upon noxious

weeds, and, as such, were decidedly beneficial, while others were indirectly of use, from the quantity of manure produced by their excreta and decaying bodies, which doubtless assisted to supply the wants of an exhausted soil. The larvæ of twelve species of common butterflies fed upon weeds, and among them were mentioned the Swallow-tail, Papilio machaon, which fed on Umbelliferous plants, and the Frittaries, Melitæa cinxia and M. artemis, whose food were various varieties of plantains, fox-glove, &c., also the genera Cynthia and Vanessa, which were very destructive to thistles, nettles, and plants of a similar character. Twelve species also fed upon valuable plants, and as such were detrimental to the agriculturist and gardener. Means should be taken to destroy them, when birds, insectivorous quadrupeds, or insects of prey, did not sufficiently lessen their numbers, and the destruction of one female imago would prevent the deposition of a great number of eggs. The three species which, from their abundance, size, and frequent attacks upon the vegetables most cultivated in gardens, had been signalled out as the greatest enemies to horticulture, were Aporia crataegi, which was especially injurious to wall fruit trees, Pieris brassicae, and P. rapae, which committed great havoc amongst garden Cruciferae (as turnips, cabbages, &c.) and P. napi, destructive to the rape, horseradish, sea-kale, and other garden plants. The larvæ which fed upon grasses were, as a rule, night-feeders, and it was therefore less easy to ascertain the comparative mischief done by various species; probably the most important were Lasiomata Aegeria, and L. megara, feeding on wayside grasses, Hipparchia semele, and especially H. tithonus, H. janira, and H. hyperanthus, which fed upon meadow grasses, as well as Coenonympha pamphilus. Thecla quercus and T. rubi lived upon the leaves of the oak and bramble respectively.

Of the British moths, 1900 species were known, and as they were mostly vegetable feeders, their numbers were very destructive. The primary division, the Sphinges, were of little economic importance, 20 out of the 30 known species being rare. S. populi and S. ocellatus lived upon the leaves of the poplar, willow, and aspen. The larva of the Death's head Hawk Moth, Acherontia atropa, was sometimes sufficiently common to injure potatoes and jasmine. The larvæ of the Privet and Elephant Hawk Moths were of little economic importance, and the Anthrocera were rather beneficial than otherwise. The class of Bombyces contained 104 species, many of great importance economically; the genus Hepialus fed generally on the roots of plants, H. humuli doing much damage underground in hop-gardens. The larva of the Goat Moth, Cossus ligniperda, did an immense amount of injury to oak, poplar, and other trees, passing two years in the larval state, during which time it tunnelled through the solid wood of the trunks; it was, however, very difficult to destroy. The caterpillars of the Pygaera bucephala too, fed in colonies on many forest trees, frequently stripping them of their leaves. Dasychira pudibunda was the source of great mischief in the hop-grounds, often seriously affecting the revenue

from that source. The larvæ of Stilpnotia salicis, and of Porthesia auriflua were very destructive to gardens; in the summer of 1782 this last species multiplied to such an extent in England that prayers were offered in the churches, and money raised to collect the webs at 1s. a bushel. The caterpillars of Clisiocampa Neustria were formidable to the gardener, feeding in colonies under a web, upon the young shoots of fruit trees, as were also those of Arctia caja, Spilosoma menthastri, and S. lubricepeda, which fed upon garden stuff.

The habits and ravages of the Night-moths were not so well known, working as they did generally in the dark. Nearly 300 species were distinguished, and the depredations of many of these, though great in the aggregate, could not be individually estimated, from their comparative scarcity. Several again were so various in their food, that when too numerous, instead of eating useless weeds, they would be induced to attack valuable plants. Nineteen species were enumerated, feeding upon various weeds, dock, plantain, chickweed, as well as upon some garden stuff, and on lichens and low herbage. Three were mentioned as highly detrimental, Cerapteryx graminis, which had been known to devastate acres of grass lands in the North of England; Mamestra brassicae, so injurious to cabbages, lettuce, &c., and Plusia gamma, which fed upon many vegetables and cultivated plants. Various species of the genus Agrotis attacked the roots of wheat and grass crops, and of other garden plants. Several other species of Noctuina were mentioned, amongst them Noctua Xanthographa, a common larva feeding on grasses, and Scopelosoma satellitia, which frequently attacked the smaller caterpillars of its own or of other species. The class of Geometræ were next considered; it numbered 270 species, but only 40 were of economic importance, and of these, 28 were decidedly injurious, and only eight or ten fed upon noxious plants. Halia wavaria and Abraxus grossulariata were very damaging to currant and gooseberry bushes, and generally abounded. The very small larvæ of Chiematobia brumata attacked the early flower buds on the fruit trees, as did also the larvæ of Eupithecia rectangulata. Amongst the Geometræ beneficial to the agriculturist were Acidalia bisetata, which fed upon dandelions, and Larentia digymata, upon various Umbelliferæ.

The British Pyralides were fewer in number, and many of these were very scarce. Pyralis farinalis destroyed grain, flour, bran, &c. Aglossa pinguinalis fed on saddles and harness. Galleria mellonella and Aphomia colonella fed on the wax in the nests of hive and other bees: Ephestia ficella and E. interpunctella lived on dried fruits, &c. A few common species fed upon noxious weeds, including even the stinging nettle. The larvæ of the Veneer Moths were probably grass-feeding. The class Tortricina included many species, and was, on the whole, very destructive to agricultural produce, fruit and forest trees, and various bushes and useful plants. Among the more common and generally destructive, from the variety of their food, were mentioned Tortrix ribeana,

several species of Lozotænia, Ptycholonia, Lecheana, and Hedya. The caterpillar of Semasia Woeberana where abundant, did an immense amount of injury, mining under the bark of fruit trees, and thus opening up a passage for insects of other orders; the genera Carpocapsa and Cnephasia had somewhat the same habits. Several species of Tortricina were then mentioned as beneficial to agriculture, feeding on weeds, and in some cases also, as Halonota and Cirsiana, mining the stems of the larger weeds.

The Tineina were the largest group of British moths, containing about 700 species, but the individuals were the smallest in size. Many species were excessively abundant, and in the larval state, collectively more destructive to property than the other divisions. The larvæ differed in their modes of feeding, some mining in the leaves, bark, and stems of plants, or in textile fabrics, others formed cases to work in, while a third set resembled the Tortricina in enclosing themselves in a rolled-up leaf. The Black cloak Woollen Moth, Tinea tapetzella, was exceedingly destructive to woollen cloth, curtains and beds, and objects of natural history, and, like allied species, was very difficult to get rid of. T. granella, feeding on barley, might destroy the contents of a granary. T. pellionella especially attacked feather and wool pillows, linings of carriages, &c. The genera Incurvaria and Swammerdamia were very injurious to fruit trees and bushes, being often extremely abundant, while Argyresthia and Gracilaria caused great damage among hawthorn, sloe, apple, birch, willow and other trees. Amongst those which rolled and twisted-up leaves were mentioned several species of the genus Gelechia. The genera Ornix, Coleophora, and Lithocolletis were very destructive, Eleachista also, especially to grasses, and Lyonetia, Cemiostona, and Nepticula closed a long list of these highly injurious insects. A few genera were then mentioned as feeding on valueless plants, or even on agricultural pests; among them Tinea arcella and T. cloacella, which fed upon rotten wood and fungi; Depressaria, some species of which lived upon hemlock, Gelechia, and Gracilaria. The larvæ of the Pterophorina mostly fed on wild and uncultivated plants, and were therefore to be viewed as beneficial to the agriculturist, though in a small degree. The author thus concluded his paper:—

"I shall briefly recapitulate, in conclusion, the number of species beneficial to agriculture by checking the growth of weeds, and those that injure crops and fruit or forest trees. I pass over as too scarce to be estimated with any measure of accuracy, 1712 species out of the nearly 2,000 butterflies and moths which are found in Britain. I have considered 32 butterflies and 252 moths which are divided as follows. Sphinges, 10; Bombyces, 17; Noctuæ, 38; Geometræ, 40; Pyralidina, 20; Tortricina, 51; Tineina, 72; and Pterophorina, 4; or a total of 284 species, or one-sixth of the entire list of British butterflies and moths. Of the caterpillars of the butterflies, 17, or more than one-fourth of the entire British species, feed on plants valued by man, and 15, or less than one-fourth, on those that are either trouble-

some weeds or little regarded by him. Of those of the Sphinges, five attack shrubs valued by man, and five weeds, or less than one-sixth of the British species in each case. Of the caterpillars of the Bombyces, 17 feed on plants of economic importance to man, or about one-sixth. Of those of the Noctuæ, 19 feed on valuable, and an equal number on plants valueless to man. Of the Geometræ, 28, or one tenth, feed on trees and other plants useful to man, and only 10 or 12, or one-twentyeighth on those he does not value. Of the Pyralidina only 11, or less than one-sixteenth are injurious, and nine, or more than one-eighteenth of the entire list, are beneficial economically. Of the Tortricina, 39 are injurious to valuable plants, or more than one-seventh of the entire British species, and 12 attack worthless weeds, or rather less than one-twentysixth. Of the Tineina 54 attack plants or goods valued by man, or more than one-twelfth, and 18, those not valued by him, or less than one-thirty ninth the entire British list. Of the common Pterophorina, about four attack plants not valued by man, or about one-ninth of the British species.

Before taking leave of insects I would call your attention again to their value as food for birds, fish, and reptiles. They thus indirectly contribute to the food of man. Some insects, however, in other countries afford direct food to the inhabitants, and one species—the cheese-mite—to the epicures of Britain. Moths and butterflies, like bees and other classes of insects, as they flit from flower to flower, carry about with then that fecundating dust, without which many a blossom, a bright new birth, a fragrant atom, would die and leave no seed. The world cannot bear unchecked vegetation. Man, the chief gardener, claims the choicest fruit; monkeys and birds come next; but ere the debt of Nature is paid, the smallest insect, a day labourer in 'the Paradise of plants,' must have its hire."

The paper was illustrated by the exhibition of specimens of many of the butterflies and moths whose food and habits had been described.

The President, in inviting discussion, remarked that the author had shown himself a true naturalist, in thus accumulating such a vast number of facts.

Mr. S. Barton, President of the Entomological Section, remarked that in the case of the Noctuæ, at all events, it was better and more easy to destroy the larvæ than the perfect moth, as Mr. Napier had recommended. They might be caught by saccharine matter, with which poison had been mixed.

Mr. W. W. Stoddart then read the following paper, entitled, "The Caterpillar Fungus, or Winter-worm-summer-plant," stating that he was indebted to the kindness of a friend for the specimen which he exhibited.

Every naturalist in his researches must have often observed the most extraordinary anomalies in the natural world, sometimes in abnormal forms, some-

times in abnormal habitats. Frequently insects lay their eggs in caterpillars, in which they grow and develope their progeny—others lay the eggs on the hair of mammals, and are licked off and swallowed, only for the larvæ to be living in the air-passages, to the discomfort and death of the unfortunate host. This is too commonly found in our neighbourhood, causing destruction among the calves living in the low districts of the Old and New Passages.

Some plants can only be obtained from the most out-of-the-way substances, e. g, many specimens of Splachnum are only seen on the dung of foxes, or oxen, another lives on the hoof of a dead horse. These freaks of nature are well illustrated in the specimen I have brought to show you to-night, which has been given me by a kind friend. It is half a vegetable and half an animal. The fungus I am going to describe is only found on a certain caterpillar.

The following note accompanied the specimen:—"Fungus Grubs, from Tasmania. These grubs having eaten a species of fungus, go into the ground and grow. Those grubs which do not eat it, live through their different stages."

A very good description of the caterpillar fungus by the late Dr. Pereira is in the *Pharmaceutical Journal*, vol. 2, p. 291, from which I have copiously drawn. In it there are figures of two species, the one found in China and Japan, the "Sphœrium entomorhiza," and one in New Zealand, "Sphœrium Robertsii." The former is described as three inches long, half being the caterpillar, but does not well agree with the Rev. Mr. Berkeley's description of S. entomorhiza in Smith's English Flora, vol. 5, part 2, where it is described as "carnose, *head sub-globose*, &c., &c." My specimen, however, accords well with Dr. Pereira's description of S. Robertsii.

Each individual is about six inches long, the fungus comprising more than half the length. The caterpillar is of the usual shape, having a light yellowish brown colour. The head, segments of the body, and pro-legs are distinctly recognizable. Projecting from the back part of the neck is a long club-shaped body, forming the fungus in question. As I before stated, it is a Sphœrium, probably identical with the S. Robertsii found in New Zealand, and in this opinion I am supported by Dr. Stephens, Stapleton, one of our best authorities on fungi, and who collected one of the first two specimens of S. entomorhiza ever found in England. Like the foreign,the British Sphœria are found on dead larvæ and pupæ of insects. The Sphœrium Robertsii on the table has the capitulum six-tenths of an inch long, elongated and acuminate, though not so vermiform as Dr. Pereira's figure, ostiola in my specimen indistinct from withering, perithecia elongated, asci long, containing a double row of very minute oblong sporidia, mixed with slender paraphyses. Stem, four inches long and a quarter of an inch thick, lighter in colour than the capitulum, which is very dark, nearly black. The base of the stem is furnished with root-like filaments, which are imbedded in the neck and body of the caterpillar.

Although Mr. Berkeley says the British species of Sphœria are formed on the pupæ as well as larvæ of insects, the Chinese, Japanese, and Tasmanian have hitherto only been noticed as existing on the larvæ of Lepidoptera. Dr. Doubleday, of the British Museum, says he thinks the caterpillar bearing the British Spherium entomorhiza is an Agrotis, but that on whose larvæ the New Zealand cater-

pillar lives is Hepialus virescens. This supposition is further confirmed by the fact that the Sphœrium Robertsii is only collected at the foot of the Rata tree (Metrosideros arbusta) one of the Myrtaceæ, and it is there also that the Hepialus Caterpillar is found.

The Chinese use the Caterpillar Fungus as a medicine. It is known in Canton as "Tong chong ha cho," which means "Winter-worm-summer-plant." In Japan it is called "Totsu Kaso." It is sold in Canton tied up in bundles, each containing a dozen. Du Halde says ('Description Geographique et Historique de la Chine', 3,490) that the insect fungus is scarce, and is regarded at Pekin as a foreign production. He says it grows in Thibet, but is also found on the frontiers of Se-tchuen on the borders of Thibet. Humberg (Travels in Europe, Asia, and Africa, 1770-1779, vol 3, p. 68) says, "The Chinese assign to the caterpillar fungus cordial virtues similar to those of Ging Sing. It strengthens and renovates the powers of the system, when reduced by over-exertion or long sickness." The physician of the Emperor of China says that it is used only at the palace on account of its scarcity. Black, old, rather rotten specimens cost four times their weight in silver.

Their mode of employing it is very singular, and reminds us of the recipes we often find in very old herbals. The belly of a duck is to be stuffed with five drachms of the insect fungus, and the bird roasted by a slow fire. When done, the fungus is to be taken out, the virtues of which will have passed into the duck. The latter is to be eaten twice a day for eight or ten days.

Instead of the caterpillar swallowing the fungus, it is most likely the fungal sporidia find a proper nidus in the dead caterpillar, for I cannot discover in any book that the caterpillar has ever been seen living with the fungus attached.

Much conversational discussion took place on this paper, especially as to whether the fungus grew in the body of the caterpillar during its life-time, or after its death. The general opinion seemed to be that the fungus began to grow when the caterpillar was alive, but ill, so that this extraordinary parasite was, so to speak, not only the effect, but also the cause of the death of the animal. The occurrence of mould upon flies in autumn was mentioned as another illustration of parasitic growths, and Mr. S. H. Swayne alluded in his remarks to the Ichneumonidæ, which bored into the bodies of other caterpillars, which afterwards lived for a long time with these internal parasites. Referring to the fact that this particular fungus was only found with this species of caterpillar, Mr. W. L. Carpenter spoke of the constant association of a certain species of hermit-crab (Pagurus), with a certain species of sea-anemone (Adamsia), and said that one of these animals was apparently unable to exist without the other.

The proceedings were closed with the usual votes of thanks to the authors, and also to Mr. Leipner for reading the first paper.

MEETINGS OF SECTIONS.

GEOLOGICAL SECTION.

Thursday, November 29th (postponed from 22nd inst.)—Mr. A. Leipner in the chair.

Mr. C. F. Ravis exhibited some specimens of crystals of quartz, and the President gave a short explanation of the probable mode of their formation, &c.

Mr. W. Sanders, F.R.S., F.G.S., President of the Society and of the Section, then delivered an address upon Fossil Fishes. After stating that the mode of classifying fishes varied with the object proposed to be elucidated by the lecturer, he presented to the Society a table of fossil fishes adapted to show their relation to Geological epochs. The primary divisions separated the Cartilaginous from the Osseous. The first of these comprised the great majority of the fossil, especially of those in the Palæozoic strata, while almost all the species of recent fish belonged to the Osseous division. There were three orders of Cartilaginous fishes. The first, the Plagiostomi, had the mouth transverse across the under part of the head. The gills had five apertures, and the ventral fins were abdominal; the tail was supposed to be heterocercal. Here these characteristic terms were explained, and drawings and specimens of fishes with heterocercal and homocercal tails were shown. This order contained four families: 1. The Cestraciontidæ, containing Ptenacanthus, Psammodus, &c.; 2. The Hybodontidæ, containing Ocodus and Hybodus; 3. The Squalidæ or Shark-like fish; and 4. The Raiidæ, including Myliobates and others. The second order, the Holocephali, had gills with one aperture, fins with a spine, and abdominal ventrals. The one family of this order, the Chimæroidæ, were remarkable for possessing only one tooth in each side of each jaw. The Edaphodus was shown as an example. These two orders had a Placoid exo-skeleton. The third order of fish were covered with Ganoid scales. The four primary divisions, adopted by Agassiz, into Placoid, Ganoid, Ctenoid, and Cycloid, were noticed, and the terms explained. Having given a general account of Ganoid fishes, and of the three orders of the Osseous tribes, the speaker presented a more particular account of various Genera belonging to the two orders of the Placoid. It was then announced that the subject would be resumed on a future evening, and a description would be given of the Ganoid Families of Fish.

ENTOMOLOGICAL SECTION.

TUESDAY, DECEMBER 11TH.—Mr. S. BARTON, President of the Section, in the chair.

The PRESIDENT exhibited a species of Helœus, belonging to the division of Heleides, family Tenebrionites, from Natal. Also Morpho Adonis, from South America, which, although not a rare species, was one of the most brilliant of all the diurnal Lepidoptera.

Mr. BARBER then read a short paper on the genus Quedius. This genus was represented on the continent by 32 species, 28 of which had been met with in this country; 19 species were exhibited by Mr. Barber. The genus might be described as follows:—Body elongate, Head roundish, sometimes oval; Labrum transverse, Mandibles slender, slightly dentate in the middle; Palpi filiform, maxillary palpi four-jointed, last joint more or less acuminate; labial palpi three-jointed, nearly truncate; Antennæ eleven-jointed, straight, slender, first joint elongate, the last nearly truncate or sloping, acuminate beneath; Thorax nearly always straighter than the elytra, round at the base, truncate before, posterior angles obtuse or round, having nearly always rows of punctures; Scutellum triangular, Elytra truncate, Tarsi five-jointed, Abdomen of six distinct segments. The genus might be divided into two sections, in the first of which the thorax had no punctures. There was only one British species in this section, Quedius brevis, with red elytra, antennæ, and legs. This species was found frequenting ants' nests. The other section, which comprehended all the other species, had upon the thorax two series of thin punctures, and might be subdivided as follows:—1st division:—Elytra nearly smooth, having a series of punctures; Species, impressa and lævigatus, the first being of a brilliant black colour, the other a brilliant brown black, and found amongst decayed leaves. 2nd division:—Elytra having an uniform punctuation, with the scutellum punctured; Species—molochinus, rufipes, semi-obscurus, attenuatus. Mostly found under dung. 3rd division:—Elytra having a uniform punctuation, Scutellum smooth. This comprehended the remaining species. Cruentus and seitus were subcortical species. Auricomus was found in wet moss in or near waterfalls; the abdomen of this species was striped with silvery or golden pubescence. The other species might principally be found among dead leaves or in haystacks.

CHEMICAL AND PHOTOGRAPHIC SECTION.

WEDNESDAY, DECEMBER 12TH.—Mr. P. J. WORSLEY, F.C.S., President of the Section, in the chair.

The SECRETARY announced that several members had not paid their subscriptions, and it was therefore agreed to strike off the names of those whose subscriptions were more than a year in arrear.

The **President** said that he had a few small facts to bring forward—as he thought it a pity that any should be lost, though it was difficult to estimate rightly the value of small observations. The first was the production of pure silica on a large scale, as a by-product in the manufacture of super-phosphate of lime. This substance was produced by acting upon coprolites, which were practically fossil bones, by sulphuric acid. It had been often noticed that a very offensive odour was given off during the process, accompanied by the deposit of a white substance. Investigation showed that the vapour was that of hydrofluosilicic acid, from the fluorine in the coprolites, in which there was a greater percentage of that element than in ordinary bones, and that the white deposit was pure amorphous silica, resulting from the decomposition of the acid.

The second fact was the accidental formation of crystals of iron pyrites. Some iron pots used in the sublimation of chloride of ammonium had been thrown out of use for a few weeks, and at the end of that time, in the interstices of the brick and clay surrounding them, were found these crystals. Sulphate, and chloride, of ammonium, had been heated with charcoal in these iron pans, and the mutual reaction of these substances had produced this effect.

A specimen of superphosphate of lime was shown, apparently quite dry, which became pasty and almost liquid, when an attempt was made to powder it. An explanation of the cause of this was sought.

Mr. W. L. **Carpenter** exhibited a series of very beautiful photographs of Swiss scenery by Braun, chiefly taken in the Bernese Oberland and the district immediately East of it.

Mr. **Beattie** stated that he had been able to keep a wet collodion plate sufficiently moist for use for eight hours by adding glycerine to a neutral bath, or to one slightly acidified by acetic acid. His formula was 1 oz. of pure glycerine, 1 oz. of water, 1 oz. of a 30 grain solution of nitrate of silver. He also said that the result of many observations led him to believe that the use of decomposed fixing solution, rather than imperfect washing, was the cause of the fading of photographs.

ZOOLOGICAL SECTION.

Thursday, December 13th.—Dr. H. **Fripp**, President of the section, in the chair.

Mr. S. **Barton** exhibited a rare and remarkable Coleopterous insect from Natal, and a specimen, preserved in spirit, of the Phalanger, or Australian (so-called) opossum, taken from the pouch of a female which he had shot.

The **President** exhibited microscopic preparations of a peculiar Acarus found in a box of bran from the West Indies, remarkable for its curious jaws, adapted for crushing, and for its four pair of legs. It had probably been a parasite on corn.

A set of shells from various parts of the world, presented to the Institution by Miss Jellie, of Redland, was exhibited.

Several joints of bones of the Dinornis, the gigantic extinct bird of New Zealand, lately presented to the Institution by Mr. Joseph Vickery, were laid on the table. Mr. W. Sanders made a few remarks upon them. The earliest published notice of the bird was in 1839, by Prof. Owen, who had examined a fragment of a leg-bone which had been brought first to that Institution, and had decided that it must have formed part of a gigantic bird. Other similar bones had been found in Madagascar. Three species were believed to have existed, all larger than the Dodo. Casts of the leg-bones were shown, and drawings of the other parts. Much time was spent in comparing the phalanges and other bones exhibited, with the drawings in Professor Owen's memoir, and endeavouring to ascertain their exact position and relation to one another. The various joints did not appear to have belonged to the same limb.

BOTANICAL SECTION.

THURSDAY, DECEMBER 20TH.—Mr. W. Sanders, F.R.S., F.G.S., President of the Society, in the chair.

Mr. J. W. CLARKE exhibited a series of microscopic preparations illustrating the fructification of ferns, including those of Davalia Canariense, Nothochlæna nivea, (or argentea), Niphrolepis pectinata, and of two New Zealand ferns, Ligodium articulatum, and Trichomanes elongatum.

Mr. POCKSON laid on the table the first part of a work on "The Flora of Devon and Cornwall," by Mr. I. W. N. Keys, curator of the Plymouth Institution, comprising the orders from Ranunculaceæ to Geraniaceæ.

A small collection of British mosses, collected over a period of nearly twenty years by the late Mr. William Tanner, was also presented to the Section, through Mr. Pockson. The collection included nearly 130 species, many in very good condition, showing fructification, &c., and each specimen was labelled with its name, as well as the place and date of its collection.

Mr. T. H. YABBICOM, Hon. Secretary of the Section, then brought forward some notes on the growth and structure of the Hyacinth, and illustrated his remarks with several sketches, and a very interesting series of microscopic preparations, by which the structure of the various parts was clearly demonstrated. Commencing with the seed, the contained embryo was pointed out, and its first development explained. Being monocotyledeous, its first appearance above ground was like a single blade of grass; only one radicle was seen, in which was a small swelling, which subsequently was developed into the bulb, the seed never being transformed into

the bulb. The structure of the bulb at the end of the first, second, third, and subsequent years was here explained. At the base was a spongy mass of spiral vessels and raphides, and above were the scales, which were differentiated so as to form the flower-buds. Roots were not absolutely necessary to its development, as flowers had been made to grow downwards into water from an inverted bulb. The structure of the root, leaf, and flower-stem was then demonstrated, and the cellular tissue, spiral vessels, raphides, and numerous stomata pointed out, the unusual fact being noticed that these organs were more numerous on the upper than on the under surface. The flower was then spoken of, the anthers, pollen, and stigma being shown microscopically, the fringe of glands which secreted the fertilising matter being clearly seen on the last-named organ. The abundance of starch in the bulb was then noticed, the size of the granules being between those of maize and of rice; also the abundance of raphides of oxalate of lime, in every part of the plant; and the speaker concluded his communication with some remarks upon the influence of light upon the inflorescence of the hyacinth.